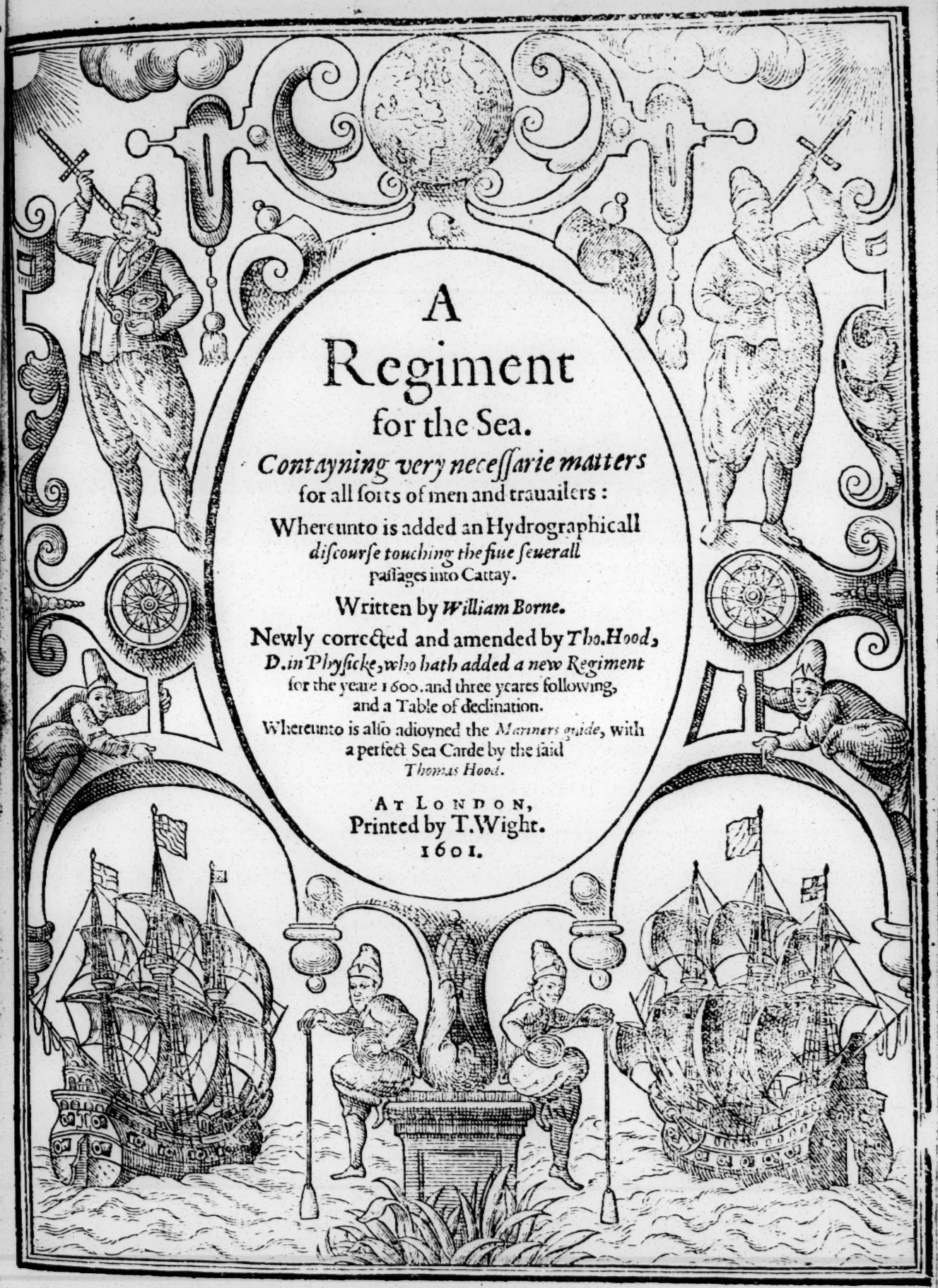


A Regiment for the Sea.

Contayning very neceſſarie matters for all ſorts of men and trauailers:

Whereunto is added an Hydrographicall *diſcourſe touching the fiue ſeuerall* paſſages into Cattay.

Written by *William Borne.*

Newly corrected and amended by *Tho. Hood, D. in Phyſicke, who hath added a new Regiment* for the yeare 1600. and three yeares following, and a Table of declination.

Whereunto is alſo adioyned the *Mariners guide*, with a perfect Sea Carde by the ſaid *Thomas Hood.*

AT LONDON,
Printed by T. Wight.
1601.

To the Right Honorable George Earle of Cumberland, *Baron Clifford, Lord Bromflet, Atton, Vescie* and Vypont: Lord of Westmerland, and knight of the most honorable order of the Garter.

WHen this booke Right Honorable was first imprinted, it came forth vnder the Patronage of the Right Honorable *Edward* Earle of *Lincolne*, sometimes Lord high Admirall of England: That impression being dispersed it hath been thought good, that the booke should be corrected and put vnto the presse againe, the labour was assigned vnto me: the which I was willing to vndertake, both becausse it was earnestly requested, and I adiudged it profitable for the common wealth: but being readie to come foorth it wanted a Patron, which was not conuenient being so honorably protected heeretofore, and deseruing now as well, as it hath alwaies done. Wherefore deuising with my selfe vppon this occasion to commend it to the Honorable Tuition of some worthie man, I was moued to dedicate it vnto your Honour: first by the generall consent of many, who wish you well, and iudge you a fit Patrone for such a worke: secondly by the honorable fauour, which (as occasion hath beene offered) I haue alwayes found at your Honours hands: thirdly, by the inclination of your mynde to marine causes. If therefore right Honorable the consent of manie, mine owne thankfull minde, whereof this is a signe, or your Honours inclination to these studies, may either seuerallie one by one, or ioyntlie altogether moue you to the Tuition of this worke, it shall be sufficiently defended (as I hope) from enuious tongues, and I by your fauour shall be inuited continuallie to imploy my pen to the commoditie of my countrie, and to make my prayer for your Honours dayly increase in all good things.

Your Honours most humblie
affectionate *T. Hood.*

To the Reader.

GEntle Reader, I haue thought it good now in this Impreſſion to mend or correct certaine faults that were in the firſt, but moſt ſpecially in the ſecond Impreſſion: For that it was printed the ſecond time I not knowing thereof, ſo that it had not onely thoſe faults that were printed out of the firſt written coppie, but now a number of new faults more than that it had in the firſt: wherefore I haue not onely mended and corrected thoſe faults, but in like maner I haue added other neceſſarie matters, not before this time printed, as this; What eccentricitie is, and alſo what Paralax is, and his vſe, as it doth appeare in the 6. folio of the booke. And alſo I haue in like maner ſhewed how that ſea-men ſhall know when that the Moone is in hir ſlow, and ſwift motion, which is knowen by the Prime, as it is declared in the third Chapter. And alſo how for to know the Moones latitude as it is ſhewed in the fourth Chapter. And alſo I do ſhow in the fift Chapter, the cauſe that there is more dayes from the Equinoctiall of March vnto the Equinoctiall of September, then there is from the Equinoctiall of September, vnto the Equinoctiall of March. And alſo I haue added vnto the tenth Chapter, certaine matters as touching diſcoueries vnto the North parts. And furthermore, I haue ſhewed in the foureteene Chapter, how for to know how faſt or ſoftly that any ſhip doth goe, and how for to keepe a perfect account of the ſhips way. And alſo I haue altered cleane the ſeuentenih Chapter, and ſhewed how that the ſea-men ſhall know what part or quantitie that they haue paſſed or gone of the whole earth, whereby that they ſhould knowe the diuerſitie of aſpects, as the Eclipſes of the Moone, and the alteration of time, and alſo I haue added diuers things in ſundry places of the Booke, that I doe omit for breuitie. And in like manner I haue added vnto the ende of the booke a Hydro-

graphicall discourse for to goe vnto Cattay fiue seuerall or sundrie wayes, that is to say, the first way is about by Cape bone sperance, which is that way that the Portugals goe vnto Calicut, and vnto the Moluccas, and other places in the East Indies: The second waye is through the straights of Magellane, into the South sea. The third way is towards the Northwest, whereas Captaine Forbisher, and Christopher Hall, hath begunne the discouerie now called Meta Incognita. And the fourth way is by the Northeast by the coast of Noua Zembla, that maister Stephen of Borose hath begunne that discouerie. And the fifth way is by the North Pole, if that it be Nauigable, &c.

Now it is possible that I may be enuied of diuers and sundry people, for that I haue written this discourse of the passages vnto Cattay, for that the nature of a number of men is to dislike of all things not done by themselues: But notwithstanding all is one vnto me whether they do like or dislike. For that I doe knowe some persons haue alreadie made euill report of that I haue written before this time, yet notwithstanding I will not stay my pen for their malice: for although their skill is much more than mine, my meaning is not to teach any of them, but to instruct the simplest sort of sea-men, and to shewe vnto them such things as is necessarie for them for to knowe. And also some sort of people are of that nature, if that they write or talke of any things past their capacitie, then they will say that he can talke well, but they themselues cannot talke, but they can do, but this is the truth, whatsoeuer he be that will say that he can do any thing, and if that he cannot shewe the reason of the doing thereof, I doe say vnto you he can not doe it, and this is most certaine, for if that he doth it, he doth it but by fortune, euen as he that drew his bow by chance in the Assyrians hoast, and slewe Achab the King of Israell, as we doe reade in the third booke of the Kings, and the last Chapter, when that Iosaphat the King of Iuda, and Achab King of Israell, went to battaile against Ramoth in Gilead.

For

For this is generall amongſt Sea-men and alſo Gunners, how ſimple or without ſkill ſoeuer that they be, if that they haue once taken charge to be the Maſter of a Ship, he thinketh great ſcorne to learne at any mans hand, but will bragge of himſelfe how long he hath beene a Maſter, and God knoweth vtterly without ſkill, but that he is a Coaſter, and doth knowe the markes for to carry a Ship ouer the Lands ende, and ouer the Naaſe.

But good ſimple men, if that they could not do that, then there were nothing in them: For euery man muſt needes be ſkillfull and know that place, that a number of times he hath occupied, and hath beene taught vnto him.

And who doubteth but a ſimple Fiſherman of Barking, knoweth Barking Creeke, better than the beſt Nauigator or Maiſter in this land: ſo who doubteth, but theſe ſimple men doth knowe their owne places at home. But if they ſhould come out of the Ocean Sea to ſeeke our Channell, to come vnto the Riuer of Thames, I am of that opinion, that a number of them doeth but grope as a blinde man doth, and if that they doe hit well, that it is but by chaunce, and not by any cunning that is in him.

But I doe hope that in theſe dayes, that the knowledge of the Maiſters of Ships is verie well mended, for I haue knowen within theſe 20. yeeres, that they that were auncient Maſters of Ships haue derided and mocked them that haue occupied their Cardes and Plattes, and alſo the obſeruation of the Altitude of the Pole, ſaying: that they care not for their ſheepes ſkinnes, for he could keepe a better account vpon a boord.

And when that they did take the Latitude, they would call them Starre-ſhooters, and Sunne-ſhooters, and would aſke if they had ſtriken it. Wherefore now iudge of their ſkills, conſidering that theſe two points are the principall matters in Nauigation. And yet theſe ſimple people will make no ſmall bragges of themſelues, ſaying: that he hath beene Maſter this twenty yeares, and neuer had no miſfor-

tune, and also if that they could heare of any, that did vse Plats and instruments that had any misfortune, then they would not a little brag of themselues, what notable fellowes they themselues were.

O what a notable folly was in these men, not considering what they themselues were. For this is most certaine, that it is not wisedome nor cunning, that can preuent or alter Gods prouidence, if that it pleaseth him to lay his scourge vpon vs. For if that men through cunning could prouide that no misfortune should happen vnto them, then were they Gods and not men, and yet notwithstanding we must not condemne cunning and knowledge, but put all things vnto fortune, then you may take one from the plough, and make him master of a Ship, and say he hath good fortune. And thus (gentle Reader) I cease, requesting thee to accept this as a simple present, proceeding of good will.

Thine, *W.B.*

FOR that the common people do fall into such a number of errours as touching the length of the day, holding an opinion, that in euery 15. dayes, the day is an houre longer or shorter, the truth is this: the day doth keepe no such proportion in the lengthning and shortning, but doth lengthen and shorten according vnto the swiftnesse and slownesse of the Sunnes declination: for when the Sunne hath swift declination, then doth the day lengthen and shorten apace: and when that the declination is slow, then doth the day lengthen or shorten but slowly. And yet the most part of the common people do hold an opinion, that at Christmasse or else at New yeeres day at the furthest, the day must needes be an houre longer, and yet the Sunne hath not declined or come towards the Equinoctiall two degrees and a halfe, which will not make halfe an houre in the length of the day: wherefore I doe thinke it good to declare through the whole yeere, when the day is an houre longer or shorter heere in this place, for the latitude or height of the Pole Articke at London, the Pole being raised fiftie one degrees, thirtie two minutes, or thirtye foure minutes: and our longest Summer day is sixteene houres and a halfe, and our shortest Winter day seauen houres and a halfe, from the rising of the Sunne vnto the setting of the Sunne: and first this: the shortest Winter day, is the 11. or 12. day of December, and the Sunne riseth a quarter of an houre after eight, and setteth a quarter of an houre before foure of the clock, and the Sunne hath his greatest declination vnto the Southwards. The 29. day of December, the day is a quarter of an houre longer, and the sunne riseth at eight of the clocke, and setteth at foure. The 17. or 18. of Januarie, the day is an houre longer, and not before, for the sunne must be declined from his Solstice of winter, fiue degrees and twelue minutes, before the day is lengthened an houre, so that I doe affirme, that from the fourth or fift daye of Nouember, vnto the 17. or 18. day of Januarie, in all that time

the day is but one houre shorter or longer, which is the time of ten weekes. The 27. or 28. of Januarie the night is fifteene houres long, then riseth the Sunne halfe an houre after seauen, and setteth halfe an houre after foure of the clock. The seauenth or twelfth day of Februarie the day is ten houres long, then riseth the Sunne at seauen, and setteth at fiue of the clock. The six and twentie day of Februarie the day is a leauen houres long, then riseth the Sunne halfe an houre after sixe, and setteth halfe an houre after fiue of the clock. The leauenth day of March, then the Sunne is in the Equinoctiall, and the day iust 12. houres long all the world ouer. The 24. day of March, the day is 13. houres long, and then riseth the Sunne halfe an houre before sixe, and setteth halfe an houre after sixe of the clock. The seuenth day of Aprill the day is foureteene houres long, and then riseth the Sunne at fiue of the clock iust, and setteth at seauen of the clock iust. The 23. day of Aprill the day is fifteene houres long, and then riseth the Sunne halfe an houre before fiue, and setteth halfe an houre after seauen of the clocke. The 15. day of May the day is 16. houres long, then riseth the Sunne at foure of the clocke, and setteth at eight of the clocke iust. The eleuenth of June the Sunne hath his greatest declination to the Northward, and then is our longest summer dayes consisting of sixteene houres and a halfe, from the sunne rising vnto the sunne setting, so that the sunne riseth a quarter of an houre before foure, and setteth a quarter of an houre after eight of the clock. The tenth day of July the day is sixteene houres long, then riseth the sunne at foure, and setteth at eight of the clock. The last day of July, the day is fifteene houres long. The 16. day of August the day is foureteene houres long. The last day of August the day is 13. houres long. The thirteene or foureteene of September the sunne is in the Equinoctiall, and the day is iust twelue houres long. The 27. day of September the day is 11. hours long. The 11. day of October the day is ten houres long. The 26. day of October the day is nine houres long. The 15

day

day of Nouember the day is eight houres long: and so vnto the 11. or 12. day of December, at which time the day is at the shortest, as before is declared.

Thus much haue I said, as touching the length of the day by euen houres, which some people will haue at the entrance of the Sunne into the 12. signes, but it is not so, yet this you may obserue, that when the Sunne hath declined fiue Degrees and twelue Minutes in this our Latitude, then is the day one houre longer or shorter. You shall finde this matter more largely spoken of, concerning the length of the day in all places thorough the world, in the 11. Chapter of the Booke.

A table of the reigne of Kings since the Conqueſt.

number of Kings and Queenes.	The names of the Kings of England	Beginning of their Reigne	Time of their death.	The place of their buriall
1	William Conqueror	14 Oct.	9 Sept. 1087	Cane in Nor.
2	William Rufus	9 Sept.	1 Augu. 1100	Weſtminſt.
3	Henrie the firſt	1 Aug.	2 Decē. 1136	Reding.
4	Stephen	2 Decē.	25 Oct. 1154	Feuerſham.
5	Henrie the ſecond	25 Oct.	6 July 1189	Fonteuerard.
6	Richard the firſt	6 July	6 Aprił 1199	Fonteuerard.
7	John	6 Aprił	19 Oct. 1216	Worceſter.
8	Henrie the third	19 Oct.	16 Nou. 1272	Weſtminſt.
9	Edward the firſt	16 No.	6 July 1307	Weſtminſt.
10	Edward the ſecond	6 July	25 Jan. 1327	Gloſter.
11	Edward the third	25 Jan.	21 Jun. 1377	Weſtminſt.
12	Richard the ſecond	21 June	16 Sep. 1400	Weſtminſt.
13	Henrie the fourth	16 Sep.	20 Mar. 1413	Canterburie.
14	Henrie the fifth	20 Ma.	31 Aug. 1422	Weſtminſt.
15	Henrie the ſixt	31 Aug.	4 Mar. 1561	Winſore.
16	Edward the fourth	4 Mar.	9 Aprił 1483	Winſore.
17	Edward the fifth	9 Aprił	22 June 1484	Weſtminſt.
18	Richard the third	22 June	22 Aug. 1486	Leyceſter.
19	Henrie the ſeuenth	22 Aug.	22 Aprił 1509	Weſtminſt.
20	Henrie the eight	22 Aprił	28 Jan. 1547	Winſore.
21	Edward the ſixt	28 Jan.	6 July 1553	Weſtminſt.
22	Queene Marie	6 July	17 No. 1559	Weſtminſt.
23	Queene Elizabeth	17 No.		

The Kalender.

Ianuarie hath xxxj. dayes.

3	1	a	New yeeres day.
	2	b	Octa. Stepha.
11	3	c	Octa Iohn.
	4	d	Octa Inno.
19	5	e	Thesolopho hi.
8	6	f	Twelfe day.
	7	g	Iulian mart.
16	8	a	Seuerine Bish.
5	9	b	Martian Virg.
	10	c	Paule first her.
13	11	d	Sunne in Aquar.
2	12	e	Satire mar.
	13	f	Oct Epipha.
10	14	g	Isidore mart.
	15	a	Maurice.
18	16	b	Antony Abbot.
7	17	c	Marcelle Bish.
	18	d	Prisce Bish.
15	19	e	Mari. and his fel.
4	20	f	Fabian and Sa.
	21	g	Agnus virg.
12	22	a	Vincent mar.
1	23	b	Emerice.
	24	c	Thimothy discip.
9	25	d	Con. of Paule.
	26	e	Policarp. mart.
17	27	f	Chrisost. Doct.
6	28	g	Theodore.
	29	a	Valerie Bish.
14	30	b	Tran S. marke.
3	31	c	Ciri. and Jan.

Februarie hath xxviij. dayes, & in the yeere of Bisiextilis xxix. daies.

	1	d	Brigit Fast.
11	2	e	Puri. of Mary.
19	3	f	Blase mart.
8	4	g	Gilbert Confess.
	5	a	Agathe Virg.
16	6	b	Dorothie Virg.
5	7	c	Amandus Bish.
	8	d	Salomon.
13	9	e	Sunne in Pisces.
2	10	f	Sother bishop.
	11	g	
10	12	a	Euphrase virgin.
	13	b	Valantine Bish.
18	14	c	Faustine Bish.
7	15	d	Julian Virgin.
	16	e	Constance virgin.
15	17	f	Simeon martir.
4	18	g	Gabine Priest.
	19	a	
12	20	b	60 martirs.
1	21	c	70 martirs.
	22	d	Peters Chaire.
9	23	e	Sirener Fast.
	24	f	Mathie Apostle.
17	25	g	Policar Bishop.
6	26	a	Victor and his fel.
	27	b	Agustine Bishop.
14	28	c	Oswale Bishop.

The Kalender.

			March hath xxxj. dayes.				Aprill hath xxx. dayes.
3	1	d	Dauid Bishop		1	g	Theodoze virgin
	2	e	Basilic mart.	11	2	a	Mary Egiptian
11	3	f	Maxime mart.	19	3	b	Richard Bishop
	4	g	Lucius mart.	8	4	c	Ambroſe Bishop
19	5	a	Focius mart.		5	d	Marci. and Ma.
8	6	b	Uict. and benin.	16	6	e	Sextus mart.
	7	c	Tho. de Aquin.	5	7	f	Euphemi. virgin
16	8	d	Apoline mart.		8	g	Deniſe mart.
5	9	e	40. Martirs	13	9	a	Perpetuus bishop
	10	f	Gzegoze bishop	2	10	b	Mercus mart.
13	11	g	Sunne in Aries		11	c	Sunne in Taurus.
2	12	a	Zacharie bishop	10	12	d	Appoline martir
	13	b	Longine mart.		13	e	Sother mart.
10	14	c	Patricius bishop	18	14	f	Tiburt mart.
	15	d	Gertrude virgin	7	15	g	Oſmond bishop
18	16	e	Anſelme		16	a	Iſidoze bishop
7	17	f	Edward King	15	17	b	Anicete bishop.
	18	g	Joſeph ſponſ.	4	18	c	Eluther Bishop
15	19	a	Cutbert bishop		19	d	Tiburtius Conf.
4	20	b	Benedict Abbot	12	20	e	Hermogenes
	21	c	Affrodoſe bishop	1	21	f	Quintine.
12	22	d	Pigment. bishop		22	g	Clete Bishop
1	23	e	Theodoze.	9	23	a	Geoꝛge marter
	24	f	Faſt		24	b	Wilfride Conf.
9	25	g	Annun. of Mary	17	25	c	Marke Euangel.
	26	a	Laſtoze marter	6	26	d	Anaſtace Bishop
17	27	b	John Heremy		27	e	Uitalis mart.
6	28	c	Doꝛothe marter	14	28	f	Peter of Mi.
	29	d	Euſtace.	3	29	g	Clete Bishop.
14	30	e	Sabine virgin		30	a	Dep. of Erken.
3	31	f	Balbine virgin				

May hath xxxj. dayes.				June hath xxx. dayes.			
11	1	b	Philip and Iacob.	19	1	e	Nicodeme.
	2	c	Athanasius bish.	8	2	F	Erasmus.
19	3	d	Inu. of the crosse.		3	g	Basill.
8	4	e	Thristopher	16	4	a	Marcel martir.
	5	F	S. Augustine.	5	5	b	Petrocius Conf.
16	6	g	John Port lat.		6	c	Boniface bishop.
5	7	a	John of Beuer.	13	7	d	Medard and gil.
	8	b	Appe. of Mich.	2	8	e	Transl. Edmond.
13	9	c	Transl. of Ni.		9	F	Yuan Confes.
2	10	d	Gordaine.	10	10	g	Tran. of Wol.
	11	e	Sunne in Gemini.		11	a	Barnabe Apostle.
10	12	F	Victorius mart.	18	12	b	Sunne in Cancer.
	13	g	Seruatius Con.	7	13	c	Anthony Confes.
18	14	a	Boniface mart.		14	d	Basilides con.
7	15	b	Sophia Virgin.	15	15	e	Vate modeste.
	16	c	Brandon bishop.	4	16	F	Transl. Richard.
15	17	d	Transl. of Bar.		17	g	Botulph confes.
4	18	e	Dioscor. martir.	12	18	a	Eruperie bishop.
	19	F		1	19	b	Gerualius mart.
12	20	g	Dunstane Conf.		20	c	Tran. Edward.
1	21	a	Barnardine.	9	21	d	Walburge vir.
	22	b	Helene Queene.		22	e	Albane mart.
9	23	c	Petronil.	17	23	F	Fast
	24	d	Julian virg.	6	24	g	Iohn Baptist.
17	25	e	Desidere mart.		25	a	Transl. of Elig.
6	26	F	Adelme. Conf.	14	26	b	John and Pa.
	27	g		3	27	c	Crescens mart.
14	28	a	Germaine bish.		28	d	Fast.
3	29	b	Nicodeme.	11	29	e	Peter and Paule.
	30	c	Cosme mart.		30	F	
11	31	d	Felix bishop.				

The Kalender.

Iuly hath xxxj. dayes.

19	1	g	Octa. John Bap.
8	2	a	Visit. of Mary.
	3	b	Gregory Bishop.
16	4	c	Domitius mart.
5	5	d	Parthene Con.
	6	e	Procope mart.
13	7	f	Zenone mart.
2	8	g	Paterian bishop.
	9	a	Pius bishop.
10	10	b	Dog daies beg.
	11	c	Herinaco. for.
18	12	d	Anaclete bishop.
7	13	e	Quirine and Iu.
	14	f	Sunne in Leo.
15	15	g	Marine virgin.
4	16	a	Simph cum 7.
	17	b	Arlene hem.
12	18	c	Praxede virgin.
1	19	d	Margar. Virgin.
	20	e	Praxede Virgin.
9	21	f	Appoline Bishop.
	22	g	Mary Magdalen
17	23	a	Christian.
6	24	b	Fast.
	25	c	Iames Apostle.
14	26	d	Anne mo. of Ma.
3	27	e	Panthalcon.
	28	f	Samplon bishop.
11	29	g	Mary Virgin.
	30	a	Abbo. and sen.
19	31	b	German Bishop.

August hath xxxj. dayes.

8	1	c	Lammas.
16	2	d	Stephen Bishop.
	3	e	Finding of Ste.
5	4	f	Iustine Priest.
	5	g	Festum niuis.
13	6	a	Transla. Domini.
2	7	b	Feast of Jesu.
	8	c	Tiracke and his fel.
10	9	d	Roman martir.
	10	e	Laurence martir.
18	11	f	Tiburt and Su.
7	12	g	Clare Virgin.
	13	a	Ypolite Virgin.
15	14	b	Sunne in Virgo.
4	15	c	Assumption of Mary.
	16	d	Roche Confess.
12	17	e	Octa. Laurence.
1	18	f	Agapite martir.
	19	g	Lewes bishop.
9	20	a	Dog daies end.
	21	b	Anastase martir.
17	22	c	Timo and Hip.
6	23	d	Eleazor. Fast.
	24	e	Bartholmew Apostle.
14	25	f	Lewes King.
3	26	g	Zepherine Bishop.
	27	a	Rufus martir.
11	28	b	Augustine Bishop.
	29	c	John beheaded.
19	30	d	Felix and Auda.
	31	e	Cuthber Virgin.

			September hath xxx. dayes.
8	1	F	Giles Abbot.
16	2	g	Anthony martir
5	3	a	Eupheme.
	4	b	Moses Pro.
13	5	c	Uenturine.
2	6	d	Zacharie Prop.
	7	e	Enurce bishop.
10	8	F	Natiuity of Ma.
	9	g	Gorgone martir.
18	10	a	Nicholas de To.
7	11	b	Protece and Hi.
	12	c	Sire bishop.
15	13	d	Philip bishop.
4	14	e	Sunne in Libra.
	15	F	Nicodeme priest.
12	16	g	Edith Uirgin.
1	17	a	Lambart bishop.
	18	b	Uictor and Cor.
9	19	c	Eustace.
	20	d	Fast.
17	21	e	Mathew Apostle.
6	22	F	Maurice.
	23	g	Linc martir.
14	24	a	German Abbot.
3	25	b	Cleophin and Ap.
	26	c	Cipzian and Jul.
11	27	d	Cosme and Da.
19	28	e	Eupere bishop.
	29	F	Michaell Arch.
8	30	g	Hierome Doct.

			October hath xxxj. dayes.
16	1	a	Remigius bishop.
5	2	b	Leodegar martir.
13	3	c	Candide martir.
2	4	d	Frances martir.
	5	e	Faith virgin.
10	6	F	Gerionis.
	7	g	Marce and mar.
18	8	a	Apolinaris mart.
7	9	b	Pelagi virgin.
	10	c	Linus Confess.
15	11	d	Denice and his fel.
4	12	e	Nichasius bishop.
	13	F	Wilfride bishop.
12	14	g	Sunne in Scorpio.
1	15	a	Calixt bishop.
	16	b	Wolfran bishop.
9	17	c	Mich. of the mount.
	18	d	Luke Euangelist.
17	19	e	Etheldred virgin.
6	20	F	Friswide virgin.
	21	g	Austrebet virgin.
14	22	a	vi. M. Uirgins.
3	23	b	Mary Salome.
	24	c	Romane bishop.
11	25	d	Magloze bishop.
	26	e	Chrisp. and Chris.
19	27	F	Fast.
8	28	g	Simon and Iude.
	29	a	Narcissus bishop.
16	30	b	Germaine Conf.
5	31	c	Fast.

			Nouember hath xxx. dayes.
	1	d	All Saints.
13	2	e	All Soules.
2	3	f	Wenefride virg.
	4	g	Amantius.
10	5	a	Lete Priest.
	6	b	Leonard.
18	7	c	Wilboyde.
7	8	d	Foure crowned.
	9	e	Theodoye.
15	10	f	Martine.
4	11	g	Martine Bishop.
	12	a	Brise bishop.
12	13	b	Sunne in Sagit.
1	14	c	Tran. Erkenew.
	15	d	Macute bishop.
9	16	e	Dep. of Edmond.
	17	f	Init. Reg. Elizab.
17	18	g	Octa Martine.
6	19	a	Elizabeth mart.
	20	b	Edmond King.
14	21	c	Pres. of Mary.
3	22	d	Cicely Virgin.
	23	e	Clement mart.
11	24	f	Grisogon mart.
19	25	g	Catherine virgin.
	26	a	Line mart.
8	27	b	Vitalis Conf.
	28	c	Rufus mart.
16	29	d	Saturnini. Fast.
5	30	e	Andrew Apostle.

			December hath xxxj. dayes.
	1	f	Elegi Bishop.
13	2	g	Liban mart.
2	3	a	Dep. of Osmond.
	4	b	Barbara Virgin.
10	5	c	Sabba Bishop.
	6	d	Nicholas Bishop.
18	7	e	Octa. Andrew.
7	8	f	Con. of Mary.
	9	g	Cipzian Bishop.
15	10	a	Eulalie Virgin.
4	11	b	Antippe.
	12	c	Damase Conf.
12	13	d	Sunne in Capricor.
1	14	e	Nicasius virgin.
	15	f	Othalie virgin.
9	16	g	O Sapientia.
	17	a	Lazarus Con.
17	18	b	Gratian Bishop.
6	19	c	Uenetia virgin.
	20	d	Fast.
14	21	e	Thomas Apostle.
3	22	f	rrr. martirs.
	23	g	Victor virgin.
11	24	a	Fast.
	25	b	Christmas day.
19	26	c	Stephen Mart.
8	27	d	Iohn Euangel.
	28	e	Innocents day.
16	29	f	
5	30	g	Tran. of James.
13	31	a	Siluester mart.

A Table or Kalender for 24. yeeres,

shewing the Prime, the Sundayes letter, and Leape yeere, and the mooueable feasts, as the first Sunday in Lent, and Easter day, Ascention day, and Whitsunday.

The yeare of our Lord.	The Prime.	Dominicall Letter.	First Sunday in Lent.	Easter day.	Ascention day.	Whitsunday.
1596	1	dc	28. Febru.	11. Aprill.	20. May	30. May
1597	2	b	13. Febru.	27 March	4. May	15. May
1598	3	a	5. March.	16. Aprill	25. May	4. June
1599	4	g	25. Febru.	8. Aprill.	17 May	27. May
1600	5	fe	9. Februa.	23 March	1. May	11. May
1601	6	d	1. March.	12. Aprill	21 May	31. May
1602	7	c	21. Febru.	4. Aprill	13. May	23. May
1603	8	b	13. March	24. Aprill	2. June.	12. June
1604	9	a.g	26. Febru.	8. Aprill.	17. May	27. May
1605	10	f	17. Febru	31. March.	9. May	19. May
1606	11	e	9. March.	20. Aprill.	29. May	8. June.
1607	12	d	22. Febru.	5. Aprill.	14. May	24. May
1608	13	cb	14. Febru.	27. March.	5. May	15. May
1609	14	a	5. March.	16. Aprill.	25. May	4. June.
1610	15	g	25. Febru.	8. Aprill.	17. May	27. May
1611	16	f	10. Febru.	24. March.	2. May	12. May
1612	17	ed	1. March.	12. Aprill.	21. May	31. May
1613	18	c	21. Febru.	4. Aprill.	13. May	23. May
1614	19	b	6. March.	17. Aprill.	26. May	5. June.
1615	1	a	26. Febru.	9. Aprill.	17. May	27. May
1616	2	gf	18. Febru.	31 March.	9. May	19. May
1617	3	e	9. March.	20. Aprill.	29. May	8. June.
1618	4	d	22. Febru.	5. Aprill.	14. May	24. May
1619	5	c	14. Febru.	28. March.	6. May.	16. May

A profitable and neceſſarie rule to know the beginning and ending of euerie Tearme, with their Returnes.

Hillarie Terme beginneth the xviii. of Januarie, if it be not Sunday, which then is referred vntill the next day after, and endeth the xii. of Febzuarie, and hath foure Returnes, that is to ſay:

Octauis Hillarij	Craſtino Purific.
Quind. Hillarij	Octauis Purific.

Eaſter Tearme beginneth xvii. dayes after Eaſter, and endeth the Munday next after the Aſcention day, and hath fiue Returnes, that is to ſay:

Quind. Paſch.	Menſ.	Quinque Paſchæ.
Tres Paſchæ.	Paſchæ.	Craſt. Aſcention.

Trinitie Terme beginneth the fryday next after Trinitie Sunday, and endeth the Wedneſday foztnight after, and hath foure Returnes, that is to ſay:

Craſt. Trinitatis.	Quind. Trinitatis.
Octauis Trinita.	Tres Trinitatis.

Michalmas Terme beginneth the ix. day of October, if it be not Sunday, and endeth the xxviii. oz xxix. of Nouember, and hath eight Returnes, that is to ſay:

Octauis Michael.	Craſt. Animarum.
Quind. Michael.	Craſt. Martini.
Tres Michaelis.	Octa. Martini.
Menſe Michael.	Quind. Martini.

Note alſo that the Exchequer openeth eight dayes bezoze any tearme begin, except Trinitie tearme, which openeth but foure dayes bezoze.

Thirtie dayes hath September, Aprill, Iune, and Nouember,
February hath xxviij. alone: and all the reſt thirty and one.

¶ An introduction vnto the *Regiment for the* SEA.

¶ The names of certaine things, neceſſary to bee knowne of them that are Marriners or Seafaring men, meete to be knowne of them that do practiſe Nauigation, as this: the names of the circles of the Sphere, and what they are, and their vſes: and alſo the names of other things belonging thereunto, and what they are, and their vſes.

First, what the Horizon is.

THE Horiſon is a great circle of the globe, deuiding the part of the worlde ſeene, from the part vnſeene; and this Horizon is changed when you do moue: for as you do by trauaile change your place, ſo doth the Horizon alter continually.

The vſe of the Horizon circle.

THE vſe of the Horizon is this, the height of the Sunne or any Starre is counted frō it vpward, the which height is taken with the croſſe ſtaffe, ſetting the one end with the Horizon, and the other ende with the Sunne or ſtarre, ſo that you haue a true Horizon: The which true Horiſon is to be found onelie at the Sea, or elſe vpon a very plaine ground vpon the top of a hill. Moreouer if the Sunne or Moone, or any Starre be to be ſeene, then they be aboue the Horizon: if they be not to be ſeene, then they be vnder the Horizon.

2 What the Meridian is.

THE Meridian is a great circle beginning due South, and ſo paſſing by your Zenith, that is right ouer the crowne of your head, and ſo by the two Poles of the worlde: and if you doe trauaile due South and North, you doe not

chaunge your Meridian: but in the going or trauailing any other way, you do chaunge it.

The vse of the Meridian circle.

THE vse of the Meridian Circle is, to knowe the iust time of noone by the Sunne: for as soone as the middle of the sunne is in the Meridian, then it is noone, and when the Sunne, Moone, or any Starre is in the Meridian, then they be farthest from the Horizon, and it is a meete time to take their height, for to knowe the Altitude or height of the Pole of the world, whereby you may perfectly knowe, how farre you be to the Southwards, or Northwards of any place.

3. What the Equinoctiall circle is.

THE Equinoctiall is a great circle in the heauens, equally distant from both the Poles, and doth passe directly ouer the middle of the earth round about, and is called the Equinoctiall, for that if the sunne be there, then thorow all the whole world the sunne is 12. houres aboue the Horizon, and 12. houres vnder the Horizon, sauing vnder the two Poles, where the Equinoctiall is coincident with the Horizon. So they shall see halfe the sunne and no more, till the sunne be departed from the Equinoctiall, and also to them that do inhabite or dwell in any place vnder the Equinoctiall, the Sunne, Moone, and all the Starres, be twelue houres aboue the Horizon, and twelue houres vnder the Horizon.

The vse of the Equinoctiall circle.

THE vse of the Equinoctiall, is to know what declination the sunne or any other starre hath from it, and on which side, by the which declination the height of the Equinoctiall is knowen, and by the height of the Equinoctiall is knowen the height of either of the two Poles of the world.

4. What the circle or Tropicke of Cancer is, being a paralel circle.

The

THE Tropicke of Cancer, is a leſſer circle of the Spheare, limiting the greateſt declination that the ſunne doth come vnto Northwards, and then is our longeſt ſummer day, and ſhorteſt night.

5. What the circle or Tropicke of Capricorne is, beeing a paralel circle.

THE Tropicke of Capricorne, is a leſſer circle limiting the greateſt declination ẏ the ſunne hath Southwards, and then is our ſhorteſt winter day, and longeſt night.

The vſes of theſe two circles be but ſmall, but that the ſunne comming vnto them, the dayes be at the longeſt or ſhorteſt, and the Sunne doth then returne backe againe, &c.

6. What the Arcticke circle is, being a paralel circle.

THE Arcticke circle is a leſſer circle of the Spheare touching the Horizon due North, increaſing and diminiſhing according to the altitude or height of the Pole: for as you do go vnto ẏ South parts, then doth your Arcticke circle growe narrower and narrower, vntill you come right vnder the Equinoctiall line, and then haue you no Arcticke circle: and if that you do go vnto the North parts, then doth your Arcticke circle growe wider and wider: where the North Pole is raiſed 66. degrees & a halfe, there the Arcticke circle and the Tropicke of Cancer are both one, and vnder the North Pole, your Arcticke circle and the Equinoctiall are both one.

The vſe of the Arcticke circle.

THE vſe of the Arcticke circle, is to know what ſtarres do neuer ſet vnto you, for all thoſe ſtarres or lights that you do ſee betweene it and the Pole, do not ſet: and if that the North Pole be raiſed more then 66. degrees and a halfe, the Sunne or Moone being in the Tropicke of Cancer, ſhall not goe downe vnder the Horizon, but ſhall be ſtill in ſight vnto you, ſo that they be not let by the clowdes and other accidents.

7. What the Antarcticke circle is, beeing a Pararlel circle.

THE Antarcticke Circle doth touch the Horizon due South, and is opposite or right against the Arcticke Circle, and doth widen & narow in all points as the Arcticke circle doth, not differing from it, saving that the Arcticke circle is aboue the Horizon, and the Antarcticke circle is vnderneath the Horizon.

The vse of the Antarcticke circle.

THE vse of the Antarcticke circle, is to knowe what Starres will not appeare aboue your Horizon, so that to the Northwards of 66. degrees and a halfe, the Sunne or Moone being in the Tropicke of Capricorne will not rise aboue the Horizon.

8. What the Zodiacke is, being a circle.

THE Zodiacke is a great circle in the heauens, vnder the which all the wandering lights or Planets do keepe their courses, that is to say, the Sunne and Moone, and the other fiue Planets or Starres, Saturne, Iupiter, Mars, Venus, and Mercurie. This circle is diuided into twelue equall partes called the xii. Signes, which are these, Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricornus, Aquarius, Pisces, the said circle standeth oblique or awrie, crossing the Equinoctiall in the middle at two places: and is 12. degrees broade, that is to say, fiue degrees from the middest Northward, and fiue degrees vnto the Southward.

The vse of the Zodiacke.

The vse of the Zodiacke is, to knowe in what signe the Sunne and Moone, and the other Planets are, and also to know the time of the chaunge of the Moone, with all the other aspects: and in like manner to knowe the aspects of all

all the other Planets vnto the Moone, and also the Planets amongst themselues: and by the aspects in the xii. signes is gathered their effects, and in what Countrie they may happen.

9. What the line Eclipticke is.

The line Eclipticke is a Circle in the very middle of the Zodiacke, vnder the which the very middle or center of the Sunne doth continually moue.

The vse of the line Eclipticke.

The vse of the line Eclipticke is this, if that the Moone or any other Starre, be vnto the North part thereof, then it is sayd, that they haue North Latitude, and if vnto the South part, then they haue South Latitude: and also by this Circle called the line Eclipticke, is knowen the Eclipse of the Sunne and the Moone.

10. What the Arcticke polar circle is, being a paralel circle.

The Arcticke polar Circle, is made by the pole of the Zodiacke, or pole of the circle Eclipticke 23. degrees and a halfe distant from the poles of the world.

11. What the Antarcticke Polar circle is, beeing a Paralel circle.

The Antarcticke Polar circle, is iust opposite vnto the Arcticke Polar, made by the Antarcticke pole.

12. What the two circles called Colures bee, &c.

The two Circles called Colures, be those that doe deuide the Zodiacke, and all the other paralel circles, into foure equall parts, the one of the circles doth crosse the Zodiacke in the first point of Aries and Libra, and so passeth by the poles of the world, and is called the equinoctiall colure: and the other Colure circle doth crosse the Zodiacke in the first point of Cancer and Capricorne, and so passeth the

two Poles of the worlde, and at the two Poles the one circle doth crosse the other: and that is called the Solstitiall Colure.

The vse of these two circles.

The vse of the two Colure circles is this, the sunne passing by them, doth deuide the yeere into foure parts in this manner, the Sunne in the first poynt of Aries is Spring time. &c.

13. What the two Poles of the world are.

The two Poles of the worlde, (that is to say, the North Pole called the Pole Arcticke, and the South Pole called the Pole Antarcticke) are two poynts in the Heauens, whereof the one is directly against the other, at the ends of the Axletree of the worlde: the North Pole is alwayes aboue our Horizon, and the South Pole Antarctike alwayes vnder our Horizon, and the Equinoctiall iust and equally betweene them, from these two Poles there must be vnderstood a right line to be drawen, which is called the Axletree of the worlde, about the which the whole Heauens, and all the lights of the Firmament be caried round from the East vnto the West in xxiiii. houres: so that no light nor place in the heauen remayneth vnremoued, but onely the two Poles of the worlde, and the said Axletree.

The vse of the Poles of the world.

The vse of the two Poles is this, to know how farre we doe transport our selues, and to knowe what Climate and temperatnesse we be in, as touching heate and cold.

14. What the two Poles of the Zodiacke are.

The two Poles of the Zodiacke or Ecliptick, imagined to be at the end of the Axletree of the Zodiacke or Ecliptick, are the Arctick pole of the Zodiacke or rather the Ecliptick,

ticke, and the Antarctick pole of the Zodiacke, the one being directly against the other, and the Zodiacke or the Ecliptick, to be iust or equall betweene them.

15. What the Zenith or verticall point is.

The Zenith or verticall point, is imagined to be a pricke in the heauens right ouer the crowne of your head, and is moueable as we our selues be, and is the Pole of the Horizon circle: and as you do transport your selfe from one place vnto another, so doth your Zenith or verticall point, and your Horizon circle also chaunge.

The vse of the Zenith or verticall point, &c.

The vse of the Zenith or verticall point is this, to know how neere or how farre off any starre is from your Zenith, by taking the true height of any Starre with an instrument, for that from your Zenith is alwayes 90. degrees downe vnto the Horizon on euerie side round about you, as it shall more plainely appeare hereafter, where I speake of degrees.

16. What a degree is.

A degree, is the part or diuision of a whole circle diuided into 360. equall parts, how big or small soeuer the circle be.

The vse of the degrees is manyfold.

The vse of the degrees, is to knowe by the Sunne and Moones course in the Zodiacke, or any other of the Planets or moueable Starres, how many degrees they be asunder: whereby is knowne at what time they haue any aspect the one with the other. And also by the degrees it is knowen what latitude & what declination any light or starre hath frō the Ecliptick or Equinoctiall: and also ỹ degrees wil shew vnto you how many miles that you do transport your selfe vpon

vpon the earth to the South or Northparts, for that euery degree doth aunswere vnto 60. English myles, in the going South and North: which is knowen by the altitude of the North Pole, or the number of degrees betweene the Equinoctiall and your Zenith or verticall point, for from your Zenith vnto the Horizon, is 90. degrees to the Southwards, and 90. degrees vnto the Northwards, which is halfe the compasse of the heauens, for twise 90. is 180. and then the earth doth hide the other halfe of the heauens: and twise 180. maketh 360. the whole content of the compasse of euerie great Circle in the heauens.

17 What a minute is.

Of Minutes there be two sorts, minutes of time, and minutes of measure, and is no other thing but the 60. part of a degree, or the 60. part of an houre: and all the diuisions in these matters is by 60. For as 60. minutes is a degree, or an houre, so 60. seconds is a minute, and 60. thirds is a second, and 60. fourths is a third, &c.

18 Altitude or height, and the vse thereof.

Altitude or the height of any thing taken (as the height of the Sunne or any Starre, or the height of the Pole aboue the Horizon: or the height of a steeple, or tower, or such other like,) is the length of the right line contained betweene the center of the Sunne or Starre, or betweene the top of any thing whose height we desire to knowe and the Horizon, limited and expressed by the degrees or parts of that instrument whereby we take the said height.

19 Latitude is wideneſſe: the vse thereof.

Latitude is in the heauens: if the Moone or any other Starre be vnto the South partes, or the North partes of the Eclipticke, that then it is sayd, to be so many degrees in latitude or wideneſſe, from the line Eclipticke to the South or Northpart: and also Latitude is counted vpon the

the earth in like maner, if that you be in any place betweene the Equinoctiall and any of the two Poles, and it is expreſſed by the degrees of the Meridian contained betweene the Equinoctiall and the Zenith, or verticall point of the place wherein you are, either to the South or North part. &c.

20. Longitude is length: the vſe thereof.

Longitude in the heauens is, the portion of the ecliptick, contained betweene the head of Aries, and that great circle which is drawne from the Poles of the Ecliptick thorough the center of the Sunne or any other Starre whatſoeuer, downe vnto the Ecliptick, the which Longitude is expreſſed either by the number of degrees contained in the ſaid portion of the Ecliptick, or elſe by that ſigne and the particular degrees of that ſigne, vpon which the foreſayde great circle drawne from the Poles of the Ecliptick doth light. As for example, if the portion of the Ecliptick contained betweene the head of Aries and that great circle which is drawen from the Poles of the ecliptick thorough the center of any ſtarre, vnto the ecliptick, do comprehend 100. 200. or 300. &c. degrees, then is the Longitude of that Starre ſayd to be ſo much, or otherwiſe if the ſaide great circle light vpon any Signe as vpon Taurus, or Gemini, then is the Starre ſaid to haue his Longitude in Taurus. &c. And alſo Longitude vpon the earth, is counted from the Canary Ilands vnto the Eaſtward, and it is that portion of the Equinoctiall which is contained betweene the Meridian of the Canarie Ilands, and the Meridian of the place aſſigned. This Longitude is denominated and expreſſed by the degrees of the Equinoctiall contained betweene the two foreſayde Meridians, ſo that if betweene the ſaid Meridians there be contained 20. 30. 40. &c. degrees, then is the aſſigned place ſaid to be ſo much in Longitude, whereby is knowne the time of the chaunges of the Moone, or any other aſpect, or any Eclipſe of the Sunne or Moone at the Citie or towne.

21. Declination is leaning: the vse thereof.

Declination is counted in the heauens, if that the Sunne or any other Starre be vnto the North part or South part of the Equinoctiall, and it is designed or expressed by the degrees of the great circle drawen from the Poles of the world through the center of the Sunne or Starre, contayned betweene the Equinoctiall and the center of the Sunne or Starre propounded, whereby it is sayd, that the Sunne or Starre hath so many degrees of declination to the South, or to the North parts as it happeneth. &c.

22 A Circumference is the line which incloseth a circle by the outer edge.

23 Diameter is the bredth of a circle, passing right ouer the center or middle thereof, from outside vnto outside.

24 Center is the middle prick in any circle, equally distant from the edge of the circle in euery place.

25 Paralel lines or circles are, two lines or more, (how many soeuer there be) equally distant in euery place alike.

26. Auge, what it is.

Auge is a point in the heauens, when the Sunne or Moone is eccentricke, going neerer vnto the Heauens, and further from the earth, than hir common order is: and the opposition thereof is, when that the Sunne and Moone doe come neerer vnto the earth, then they do at any other time.

The vse thereof.

The vse thereof is, to know when that they be in their swift motion, or in their slow motion: for the Sunne and Moone being in the Auge, moueth slower then in the opposite of the Auge.

27. Eccen-

27. Eccentricitie, what it is.

Eccentricitie is the distance betweene the center of the eccentricke circle of any Planet, and the center of the worlde.

28. What the head or taile of the Dragon is.

The head of the Dragon, is the place where that the Moone or any other Planet doth come ouer the line Ecliptick from the South part vnto the Northpart: and the taile of the Dragon is, where the Moone or any other Planet palleth ouer the line Eclipticke, from the Northpart, vnto the South part.

The vse of the head and tayle of the Dragon.

The vse of the head and the taile of the Dragon, is to knowe, when that there is any Eclipse of the Sunne or Moone: and of what quantitie or greatnes the Eclipse is.

29. Paralax what it is.

Paralax is the portion of the heauen contained betweene two right lines, whereof the one is drawen from the center of the worlde, the other from the surface of the earth, through the center of the Moone or some other Planet, vnto the Primum mobile. Addition.

The vse thereof.

The vse of the Paralax is manifold, for that it sheweth where and in what countries that the Sunne is eclipsed, as in some places the Sunne may bee all wholly Eclipsed, and in some place halfe Eclipsed, and in some partes of the earth nothing Eclipsed at all, and yet the Sunne and the Moone both aboue the Horizon, which reason is before shewed. And also the vse of the Paralax is, if that you do

see any extraordinarie light in the heauens, as Comets or blazing starres, by their Paralax their distaunce is knowne what they are from the earth, and by their distaunce their Diameter being taken, then the magnitude of the body is knowen, therefore there be great things to be knowen by the obseruation of the Paralax.

30. What Nauigation is.

Nauigation is an Art teaching how to direct our course in the Sea, to any place assigned, and by what direction, what things may stand with him, and what things may stand against him, hauing consideration how to preserue the Ship in all stormes and changes of weather that may happen by the way, to bring the Ship safe vnto the port assigned, and in the shortest time.

The vse of Nauigation.

The vse thereof is this, first to know how that the place doth beare from him, by what winde or point of the compasse, and also how farre that the place is from him, and also to consider the streame, or tide gates and Currents, which way that they do set or driue the Ship, and also to consider what dangers is by the way, as Rocks and Sands, and such other like impediments, and also if that the winde change or shift by the way, to consider which way to stand, and direct his course vnto the most aduantage, to attaine vnto the port in shortest time: and also if any stormes do happen by the way, to consider how for to preserue the Ship and the goods, and to bring hir safe vnto the port assigned. And also it is most principally to be considered and foreseene, that if they haue had by occasion of a contrary tempest, for to goe very much out of the course or way, to know how the place doth then beare, that is to say, by what point of the compasse the place doth stand from you: and also how farre it may be from

from you. Which way to be knowen, is this: First, to consider by what point that the Ship hath made hir way by, and how fast or slowly that the Ship hath gone, and to consider how often that the Ship hath altered hir course, and how much that she hath gone at euery time, and then to consider all this in your Plat or Card, and so you may giue a neere gesse, by what point or winde it beareth from you, and also how farre it is thether. And also you may haue a great help by the Sunne or Starres, to take the height of the Pole aboue the Horizon, and also in some place you may gesse by the sounding, both by the depth and also by the ground. And also it is very meete and necessary to know any place when that he doth see it.

31. Of Instruments to vse at the Sea, for to take the height of the Sunne, or any Starres.

The originall of the making of all Instruments to take the height of the Sunne or any Starre, is either a circle, or the part of a circle, whose diuision is into 360. parts, what forme so euer that it hath, as your crosse staffe it is marked according vnto the proportion of a circle: and euery one of the degrees is the equall part of a circle, namely, the three hundred and sixtie part, &c.

The vse of the Instruments.

The vse of the Instruments, as Astrolobes, or common rings, or the crosse staffe, is to take the height of the Sunne or other Starres, whose vses do follow heereafter in the booke.

32. What manner of persons be meetest to take charge of Ships in Nauigation.

As touching those persons that are meete to take charge, that is to say, to be as Master of ships in Nauigation, he

ought to be sober and wise, and not to be light or rash headed, nor to be too fumish or hasty, but such a one as can well gouerne himselfe, or else it is not possible for him to gouerne his company well: he ought not to be too simple, but he must be such a one as must keepe his company in awe of him (by discretion) doing his company no iniury or wrong, but to let them haue that which men ought to haue, and then to see vnto them, that they doe their labour as men ought to do, in all points. And the principall point in gouernment is, to cause himselfe, both to be feared, and loued, and that groweth principally by this meanes, to cherish men in well doing, and those men that be honestly adicted, to let them haue reasonable preheminence, so that it be not hurtfull vnto the Merchant, nor to himselfe, and to punish those that be malefactors and disturbers of their company, and for small faults to giue them gentle admonition to amend them: and principally these two points are to be foreseene by the Maisters, (that is) to serue God himselfe, and to see that all the whole company do so in like maner at such conuenient time as it is meete to be done: the second point is, that the maister vse no play at the dice or cardes: neither (as neere as he can) to suffer any, for the sufferance thereof may doe very much hurt, in diuers respects: and furthermore, the maister ought to be such a one, as doth know the Moones course, whereby he doth knowe at what time it is a full sea, or a low water, knowing in what quarter or part of the skie, that the Moone doth make a full sea at that place, and also the maister ought to be acquainted, or know that place well, that he doth take charge to goe vnto (except that he haue a Pilot.) And also he that taketh charge vpon him, ought to be expert how the tide-gates or currents, do set from place vnto place: and also not to be ignorant of such daungers as lyeth by the way, as rocks, sands, or bancks, and also most principally, he ought to be such a one as can very well direct his courses vnto any place assigned, and to haue capacitie how for to handle or shift himselfe in foule weather or stormes. And also it behoueth

ueth him to be a good coaster, that is to say, to know euery place by the sight thereof. And also he that taketh charge for long voyages, ought to haue knowledge in Plats or Cards, and also in such instruments, as be meete to take the height of the Sunne, or any Starre, and to haue capacitie to correct those instruments, and also he ought to be such a one, that can calculate the Sunnes declination, or else to haue some true regiment, and also he ought to knowe how to handle the Sunnes declination, when that he hath taken the height of the Sunne.

Now beginneth the Regiment for the Sea,

the first Chapter of Nauigation, and sheweth what the 32. points of the Compasse is, and to what vses they do serue.

THE first and most principall thing for any seafaring man, or trauailer, is to knowe toward what part of the earth he meaneth to go, and then being vpon the sea, where he seeth no path nor marke to trauaile by, he ought to be expert in the vse of the Needle or Compasse. Wherein this is to be noted: There be eight Capitall or head windes or points, whereof foure of them are called Cardinalles, and haue their names properly of themselues, and the other foure of them, are deriued or take their names of the other foure, as this: South and North are in the opposite points of the intersection of the Horizon and Meridian, and East is in the intersection of the Equinoctial and the Horizon, towards the Sun rising, and West is right against it. North east is in the midway betweene the East & the North, and Southeast in the midway betweene the East & the South, and Southwest betweene the West & the South, & Northwest is in ỹ middle betweene the North & the West. Moreouer, there be 8. inferior points or windes, halfe way betweene euery one of those eight capitall or head poynts or windes, and those haue the names of

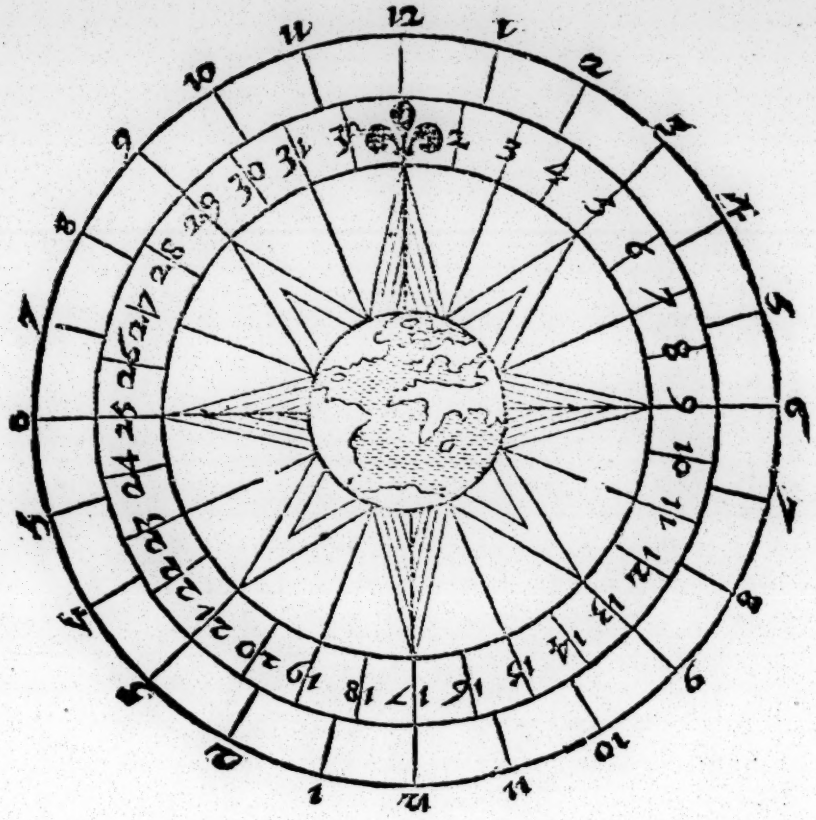
8. Capitall or head points.

8. inferior points or winds.

of the two points that he ſtandeth betweene, as that point that ſtandeth betweene the Noꝛth and the Noꝛtheaſt, is called Noꝛth Noꝛtheaſt, and that point betweene the Eaſt and the Noꝛtheaſt, is called Eaſt Noꝛtheaſt, and alſo that point that is betweene the Eaſt and the Southeaſt, is called Eaſt Southeaſt. And ſo fooꝛth vnto the reſt of the eight points, whoſe names doth folow, as South Southeaſt, and South Southweſt, and Weſt Southweſt, & Weſt Noꝛthweſt, and Noꝛth Noꝛthweſt: and now betweene euery one of theſe inferioꝛ poynts, and euery one of the head windes, there is a by-poynt oꝛ wind, and he is called a by-poynt, foꝛ that he is not named but by the name of one of the head points next adioyning. There be 16. of them in number, ſo that there be eight capitall oꝛ head poynts, and eight inferiour poynts, and 16. by-points oꝛ winds, ſo that in all there be 32. of them. The vſe of theſe points is, to direct the Ship to what quarter of the woꝛld you do aſſigne, to keepe that courſe, to finde the place ſo aſſigned, foꝛ that the pꝛopertie of the Needle oꝛ Flie, is alwayes to ſtand due South and Noꝛth.

16. by-points or winds. Addition.

As



AS touching Nauigation, for the instructions of the meanest, I haue set this figure or Compasse, where first is to be noted the 32. windes and poynts of the Compasse aboue made. The Flouredeluce is the first poynt, and these be the names beginning at the North, and so with the course of the Sunne, according vnto the common order that Sea-men doe teach or instruct their youth, which is this. North 1. North and by East 2. North Northeast 3. Northeast and by North 4. Northeast 5. Northeast and by East 6. East Northeast 7. East and by North 8. East 9. East and by South 10. East Southeast 11. Southeast and by East 12. Southeast 13. Southeast & by South 14. South southeast 15. South & by East 16. South 17. South and by west 18. South Southwest 19. Southwest & by South 20. Southwest 21. Southwest & by west 22. West Southwest 23. West

The names of the 32. points of the compas.

23. West and by South 24. West 25. West and by North 26. West Northwest 27. Northwest and by West 28. Northwest 29. Northwest and by North 30. North Northwest 31. North and by West 32. This is the whole contents of the 32. windes, and there is in the compasse the contents of the great circle, or Equinoctiall circle, being 360. degrees in Compasse, so that euerie point contayneth 11. degrees $\frac{1}{4}$. and 4. points contayne 45. degrees 8. points contayneth one quarter of the compasse or Equinoctiall circle, being 90. degrees. 16. points, contayneth halfe the circumference 180. degrees, and euery degree contayneth 60. minutes, and euery minute 60. seconds, and so foorth.

The contents of the Equinoctial circle 360. degrees one point of the Compasse containeth 11. degrees and a quarter.

Furthermore, the 32. points containe 24. houres, that is to say, one point containeth 3. quarters of an houre, or 45. minutes. And 2. points one houre and a halfe. 4. points 3. houres. 8. points 6. houres. 12. points. 9. houres. 16. points 12. houres, and so to the rest of the points. And euerie houre containeth 60. minutes, and euerie halfe houre 30. minutes, and euery quarter of an houre 15. minutes, and after that rate 45. minutes maketh three quarters of an houre.

The 32. points brought into 24. houres.

The second Chapter treateth of the Golden number or Prime, shewing the Epact, and by the Epact, to know the age of the Moone.

IT is necessarie and conuenient for the seafaring men, to knowe the Prime or golden number: for by the golden number is knowen the Epact, and the Epact sheweth the age of the Moone or chaunge day, within 12. houres vnder or ouer: and by the age of the Moone, you may know at what a clocke it doth flow, in any place that you doe knowe what Moone doth make a full sea: therefore it is meete to knowe the Epact, and that is knowen by the Prime, or Golden number. The cause why it was called the Golden number, was because it was sent out of Aegypt in letters of golde, to the Romanes.

The cause why that it is called the Prime, was for that it was the first order that the Moones course was knowen by, and it is thus knowen. Adde one to the yeere of our Lord whereof you would know the Golden number or Prime, then deuide the number by 19. the remainder is the Prime: and multiply that by 11. and looke what the number commeth vnto, deuide that by 30. the remainder is the Epact. Then when you haue once the Epact, adde 11. to your Epact for euery yeere more, and looke what that commeth to, that is your Epact: and if it doe passe 30. put that away, and keepe the remainder for your Epact. And thus this rule will serue for euer, sauing when the Prime beginneth at one, for then the Epact is 11. and then doe (as aforesayde) as you may perceiue by this Table heere following.

The cause why that it is called the Prime, or golden number.

To know how many the Epact is.

¶ The Table of Prime and Epact

for xix. yeeres, and when those xix. yeeres be ended, then begin againe, and so it will serue for euer. &c.

The yeere of the Lord	Prime	Epact		The yeere of the Lord	Prime	Epact
1599	4	14		1609	14	4
1600	5	25		1610	15	15
1601	6	6		1611	16	26
1602	7	17		1612	17	7
1603	8	28		1613	18	18
1604	9	9		1614	19	29
1605	10	20		1615	2	11
1606	11	1		1616	2	22
1607	12	12		1617	3	3
1608	13	23				

The Prime is the time of xix. yeeres.

THe Prime or golden number, is the time of 19. yeeres, in the which time the Moone maketh all hir chaunges or coniunctions with the Sunne, and when these nineteene yeeres be expired, then she beginneth againe: as for example. In the yeere of our Lord 1599. she changed the 16. day of March, and euery yeere doth alter 11. daies of hir chaunge, till the yeere 1618, and then she chaungeth the said twentie fire day of March againe, as I shewed you before: the Epact is the putting too 11. for euery yeere. Now furthermore to know the age of the Moone, do thus, take the number of the Epact for your yeere (beginning at March alwayes) and recken how many moneths it is from March, (counting March for one) then recken how many dayes of the month it is, in which you would know the age of the Moone: then

put

put all your number together, (that is to say, your Epact, your moneth frō March, & euery day of ẏ Moneth) then looke how many it amounteth vnto, that is the age of ẏ Moone, if ẏ number added doth not exceede 30. but if it passe 30. throw all the 30. away, the remainder sheweth the age of ẏ Moone, for whē the age of ẏ moone is iust 30. then is it ẏ change day. This is to be vnderstood cōcerning those months which haue 31. dayes, for in them ẏ haue only 30. dayes, the coniunction is at the 29. day, and they which passe 29. are the age of the Moone: Item vnto Februarie wee must giue 29. dayes, though ordinarily that moneth hath but 20. dayes, and if it be the fifteenth day of the age of the Moone, then the Moone is at the full. When the age is betweene seauen dayes and eight, then is the first quarter. And if it be 22. dayes old, then the Moone is at the last quarter: The rule is manifest in this example, this yeere 1599. I looke and finde the Epact 14. I would know the age of the Moone the 18. day of June. I recken how many moneths it is from March, reckening March for one, and I finde it is foure moneths: then I take and adde all these together, that is to say, 14. for the Epact, and foure for the moneths (that is to say, March, April, May, Iune,) and then 18. for the day of the moneth, and all commeth to 36. So that you may conclude, that the Moone is 7. dayes olde, and changed 7. dayes before.

To know the age of the Moone, by the number of the Epact.

The third Chapter treateth how to know *by the age of the Moone, what houre it doth* flow, or is full Sea at any place, where you do know what Moone maketh a full Sea.

NOw by the age of the Moone you may know at what houre it is a full Sea, in any place where you doe know what Moone maketh a full Sea, which rule commonly the sea-men call, the shifting their Sunne and Moone, and many wayes there be to doe it, for thus they may doe it: let them

diuide one houre into fiue parts, and then take foure of those parts, and put the first part away, that serueth for the alteration of the Moones course in 24. houres, and the foure fift parts of an houre are 48. minutes, and the fift part of an houre is 12. minutes. A floud and an ebbe doth alter 24. minutes forwards: as thus for example: it floweth 12. of the clock at the lands end, vpon the chaunge day, the Moone being in the South, at all times a full sea. The Moone being one day olde, it floweth 12. of the clocke 48. minutes, two dayes olde, it floweth one of the clocke 36. minutes, three dayes olde, it floweth 2. of the clocke 12. minutes. 4. dayes olde, it floweth 3. of the clocke 24. minutes: fiue dayes olde, it floweth 4. of the clocke iust. 6. dayes olde, it floweth 4. of the clocke. 48. minutes: seauen dayes olde, fiue of the clocke 36. minutes, eight dayes olde. 6. of the clocke 24. minutes 9. dayes olde, seauen of the clocke 12. minutes: ten dayes olde, it floweth 8. of the clocke iust 11. dayes olde. 8. of the clocke 48. minutes. 12 dayes 9. of the clocke 36. minutes. 13. dayes old. 10. of the clocke 24. minutes 14. dayes old, it floweth 11. of the clocke 12. minutes. 15. daies old, it floweth 12. of the clocke iust, then begin the full Moone: and so begin againe as you dyd before at one day olde, and so forth. For to finde the course of the tides is nothing else but to adde for euery day of the age of the Moone 48. minutes, and by this account, you may at all times knowe at what a clocke it doth flow, by putting to euery floud and ebbe 24. minutes, and to 2. flouds & 2. ebbes putting to 48. minutes.

To know the alteration of the tides in 24. houres. An ensample for the full sea vpon the lads end for euerie day of the age of the Moone.

Now furthermore, the sea-men vse to make their account by this meanes (but it is all one) they doe allow for euery day of the age of the Moone, one point and three minutes: for a point of the compasse contayneth 45. minutes, that is 3. quarters of an houre. Then they put three minutes to 45. minutes, which maketh 48. minutes, the said 3. minutes is the 15. part of a point, & from the chaunge to the full is 15. dayes, so that (the halfe compasse being 16. points) they breake the odde point into 15. parts, & that commeth to 3. minutes,

To shift the sunne and the Moone by the points of the compasse.

so

so that the alteration of the tides, for euery 24. houres be 48. minutes, or 4. fifth parts of an houre. Wherefore there shall follow a table of tides, about certaine places of this realme: for euery Moone contayneth 29. dayes 12. houres 44. minutes from chaunge to chaunge: the whole contents of the houres of the Moone, be 708. houres, and 44. minutes. And there is in euerie yeere 12. chaunges of the Moone: and the yeere contayneth 365. dayes, 5. houres 55. minutes 26. seconds. Yet some doe affirme to be odde fiue houres, but there lacketh 4. minutes 47. seconds in the Tropicall yeere. Likewise in the yeere be 12. moneths agreeable to the 12. Moones: the 12. moones containe but 354. dayes, so that there be xi. dayes more in the yeere, than there be in the 12. moones. The yeere also is diuided into 12. moneths, which moneths haue taken their names at the will and pleasure of men: as first Januarie was so called of Ianus, who had two faces: for the month of Januarie beholdeth the end of the yeere past, and the beginning of the yeere to come. Februarie tooke his name of certayne Romane sacrifices, called Februa. March is so called of Mars, for Romulus so named it, after the name of his father. Aprill comes of Aperio, because that then the earth is opened. May, of Maia, the mother of Mercurie. June so called by preparing the young men to the warre. July, of Iulius Cæsar: And August, of Augustus Cæsar, for in that moneth he entred the Consulship: then the rest of the moneths tooke their names of their number from March. Now in these 12. moneths, which make the yeere, the Sunne doth passe or goe through the Zodiack called the 12. Signes, which is the occasion of the yeere: For this is to be noted, that the Sunne, as I said before, doth goe by his naturall mouing in 365. dayes 5. houres 55. minutes, 26, seconds, through the Zodiack, containing 360. degrees, his course being from the West into the East, against the course of Primum mobile, or first mouer, being moued by the mightie prouidence of God, which maketh the 24. houres: and so doth all the 7. lights

The contents of the number of daies and houres in one moone, the houres in euery moone be 708. 44. minutes.

The cõtent of a yeere is 365. daies 5. houres 55. minutes.

How the moneths tooke their names.

The Zodiacke cõtaineth 360. degrees.

The mouing of 24. houres.

lights or Planets, except that it be in their retrogradation: but the Sunne and the Moone be neuer retrograde, as the other fiue Planets or lights be. And this is to be noted, that the Moone goeth faster then ỹ Sunne, for she goeth through the whole Zodiack in twentie seauen daies and eight houres. Now in that same time the Sunne is remoued by his naturall mooning from that place of the Zodiacke neere twentie seauen degrees: and then because that the Moone hath not found the Sunne there, it is two daies, foure houres, and foure and forty minutes more, before that the Moone ouertaketh the Sunne againe, so by that meanes, it is 29. dayes, twelue houres, and foure and forty minutes betweene the chaunge of the Moone, and the next chaunge, throw the yeere, although that the Moone may chaunge sometime in lesse time, and sometime in longer time, that is by the meanes of the three motions of the Moone, that is to say, hir swift motion, and hir meane motion, and her slow motion, which groweth by the meanes of the Moones Auge, or opposition thereof. The Moone being in Auge goeth but little more then twelue degrees in 24. houres. And in the opposition of Auge neere 15. degrees in 24. houres, and in her meane or equall motion 13. Degrees 12. minutes. So this is the occasion why sometime the Moone may chaunge sooner, or be detracted longer then the time of 29. dayes, 12. houres, and 44. minutes. This point of Auge is moueable, and doth passe throw the Zodiacke in the time of 19. yeeres: and it causeth sometime the full of the Moone to happen sooner and later. In like maner also the quarters of the Moone with all the other aspects, that the Moone hath with the Sunne, or any other of the Planets, according to the Moones motion: In like manner (by the meanes of the three motions of the Moone) sometime the Moone goeth more then one point and 3. minutes in 24. houres, and sometimes lesse then one point and 3. minutes, as this for example: the Moone being in hir slow motion, goeth but little more then 12. degrees in 24. houres, yea and sometimes lesse, and then the Sunne in that

The time that the Moone goeth thorow the 12. signes.

The three motions of the Moone.

Of Auge.

The cause why the Moone changeth rather or later.

The Moone goeth in 24. houres sometimes more degrees, & sometime fewer degrees.

that time doth go one degree: and then is there but 11. degrees betweene the Sunne and the Moone, (that is but 44. minutes.) So that the Moone is not one point in 24. houres from the Sunne. But being in hir swift motion she goeth neere 15. degrees in 24. houres, and the Sunne goeth one degree in that time: so that there is 14. degrees in 24. houres betweene the Moone and the Sunne, (that is 56. minutes) which is a point, and 11. minutes. Wherefore I do thinke it very necessary for to show somewhat of the Moones motion, that they may know when that the Moone is either in her swift motion or her slow motion, for that I do know that there is not in respect, any sea-men that doth know it, because commonly they haue not Sea-men that hath any sight or knowledge in the Moones Theorickes, therefore let them note these few words folowing.

The Moone is not one point asunder frō the Sunne in 24. houres. Additions.

Seeke out in the Ephemerides the name of the moneth wherein you would know the swiftnesse or slownesse of the Moones course. In the vttermost columne answering to that moneth towards the right hand, you shall finde the words Apog: and Perige: whereof the first signifieth the Auge of the Moone, the other signifieth the opposition of the Auge.

The day of the moneth which standeth against the word Apog: is it whereon the Moone is slowest, the other against which the word Perige doth stand, is it wherein the Moone is swiftest. The which thing you may easely proue true in this maner. Right against the word Apog seeke out the place of the Moone toward your left hand vnder the Charecter of the Moone, subduct that out of the next number following (by putting thirtie degrees vnto that which followeth if neede so require) and note the remainder. In like maner against the word Perige: seeke out the place of the Moone, and subduct it out of the next number following, compare this remainder with the former, and you shall alwayes finde it to be the greater, whereby you may conclude the Moone then to be in hir swiftest motion. The like may be wrought

by any common Almanacke by ſubducting the degrees which the Moone poſſeſſeth the firſt day of the moneth out of the degrees which ſhe poſſeſſeth the ſecond, and ſo conſequently going on from the ſecond to the third, foureteene times together, vntill you finde the greateſt or the leaſt remainder. Where you finde the greateſt remainder in that ſigne, and on that day the Moone is in her ſwifteſt motion, and in the oppoſition of her Auge, and 14. dayes after ſhe will be in her ſloweſt motion, in her Auge: but where you finde the leaſt remainder there the Moone is ſloweſt, and 14. dayes after ſhe will be in her ſwifteſt motion: This rule is vnfallible, and therefore is to be followed rather then that which being grounded vpon the Prime, is moſt vncertaine. It is moſt neceſſarie for ſea-men to know this ſwiftneſſe or ſlowneſſe of the Moone in diuers reſpects, for if that the Moone be in her ſwift motion, then it cauſeth the chaunge, quarter, or full of the Moone to be the rather. But contrariwiſe, when that the Moone commeth from her ſlow motion, then that doth detract the time the longer before the Moone doth chaunge, or is at the full or any other aſpect.

And thus much I haue ſayde of the Moones motion: for that ſome ſea-men will take vpon them to correct the Almanacks as touching the chaunge and quarters of the Moone: holding this opinion, that euery Moone ought to be equall in the number of the dayes and houres: and the full Moones to be iuſt the halfe contents. And the quarters in like manner, the iuſt fourth part in dayes and houres, ſo that ſome of them will take vpon them to tell (by the rule of the Epact,) the true houre of the chaunge, quarters, and full of the Moone. Wherein they are notably deceaued.

Errour of Mariners.

Againe, ſometime in the yeere you ſhall ſee the Moone rather then at ſome other time, as this for example. From Januarie to June, you ſhall ſee the Moone within foure and twentie houres after the chaunge, becauſe ſhe hath

North

North declination of the Sunne, and maketh a bigger Arch then the Sunne.

From July to December, you shall not see the Moone three dayes after the chaunge, because her declination is to the south part of the Sunne: but you may see her in foure and twentie houres before her chaunge. Now the seamen doe imagine a Prime day, which is the halfe quarter of the Moone: that is, when the Moone is three dayes and eightene houres olde, (the Moone being then foure points to the eastward of the Sunne, which is three houres:) the same rule may they in like case observe when the Moone is past the full three dayes and eightene houres, and also in the middes of the quarters.

Heere followeth a Table of Tides.

FIrst, the Moone South or North, on Lands ende full sea.

The Moone South and by East, at the Goze ende full sea.

The Moone south southwest, betweene holy Iland and Tinemouth, full sea.

It floweth betweene Tinemouth and Flamborough head, southwest and Northeast moone.

It floweth betweene Flamborough head, and Bridlington in the Bay, a southwest and by west moone.

The Moone in the west southwest, betweene Bridlington and Laurenas, full sea.

It floweth betweene Laurenas and Cromer all along the well: an East and west moone.

It floweth betweene Cromer and Yarmouth Rode, to Layskow North Rode, a southeast moone.

It floweth betweene Layskow Rode and Orfordenas, a southeast and by south moone.

It floweth betweene Orford and Orewel waues, a south southeast moone.

It floweth betweene the Nas and the Ware head of Colne, a south and by East moone.

It floweth at the Spittes, and at the Sheue, and all alongst the Swinne, a south moone.

At the west end of the Noze, a south and by west moone, full sea.

It floweth at Grauesend, a south southwest moone.

It floweth at London bridge, a southwest moone.

It floweth at the North Foreland, a South Southeast moone, and so alongst the coast till you come to Bechey. And in the Offing from the North Foreland to the south Foreland, it runneth halfe tide. And from the southforeland to the Nas, the tyde runneth halfe tide halfe quarter. And from the Nas to Fairely, it runneth halfe tide: and from Fairely to Beche, it runneth quarter tide vnder other.

It floweth to the Westward of Beche, a kenning, a southeast and by south moone.

It floweth at Portelmouth, a South and by East moone.

It floweth at S. Elens a south southeast moone.

It floweth on the sea side of the Iland, a southeast and by south moone: and so on the land, and at the Needles, and runneth quarter tide in the Offing.

It floweth at Poole in the hauen: a southeast moone.

It floweth at Waymouth: an East and west moone.

It floweth at Portland: a southeast moone.

It floweth from the west part of Portland, till you come vnto Plimmouth, an East and west moone.

It floweth on the shore from Plimmouth to the Lyzard: a west and by south moone. And in the Offing a southeast moone.

It floweth at Mounts Baye: an East and West moone.

It floweth at Selly: a West and by south moone.

It floweth at the Landes end of Goolfe: a West southwest moone.

It floweth all alongst the coast vp to Bristow, and the coast

coast of Ireland, from Waterford to Kinsale, a west and by south moone.

Furthermore it floweth (for the most part) from the Pooll head of Burdeaux all alongst the coast of Biskey, Galyza, Portingale, till you come to the straights of Maliga, a southwest and Northeast moone.

It floweth at Flushing, a southwest and by south moone.

It floweth at Antwarp, an East and west moone.

It floweth all alongst the coast of Flanders, from the Wildings to Calys, a South and by East moone: and so runneth halfe tide vnder the other.

Now heere is one speciall thing to be noted, and that is this: It floweth one point of the Compasse more in the spring streames, then it doth in any of the quarters of the moone, (so that it be a Riuer where there is any indraft, hauing distaunce from the Sea) when there is neither rage of windes, nor any cause either to hinder or further the said effect.

It will flow a point of the compasse more in the spring tides than in the neap.

As for example, thus: It floweth at Grauesend at the chaunge of the Moone or full, a south southwest moone. But in any of the quarters of the moone it scant floweth, a South and by West Moone: and this is generall for euer.

Tides in a riuer that hath any distance vnto the sea.

The fourth Chapter treateth of the Sunne and Moones course in the Zodiack: and how you shall know what houres the Moone shall rise and set at: and at what point of the Compasse, with other necessary things.

FUrthermore, the Sunne (by his naturall mouing thorough the twelue signes in the Zodiacke in the yeere) doth cause the height and lowneſſe of his declination: which is necessarie for the seafaring men to know, the which declination they do take from equinoctiall to equinoctiall. And this is to be noted,

that as the Sunne hath declination, ſo in like manner hath the Moone, for by her declination and the ſunne, is knowen the time of her ſhining or abiding aboue our Horizon.

To know how long the Mone ſhineth.

The Sunne or Moone in the firſt minute of Aries, do riſe Eaſt, and ſet Weſt, and ſhine twelue houres. In the firſt minute of Taurus, they riſe neare the Eaſt Northeaſt, and ſet neere the Weſt Northweſt, and ſhine ſomewhat more then 14. houres. In the ſigne of Gemini, they riſe neere the Northeaſt and by Eaſt, and they ſet neere the Northweſt and by Weſt, and ſhine neere ſixteene houres. In the ſigne of Cancer, the firſt minute, they make theyr greateſt declination to the Northwards, and they riſe neere the Northeaſt, and ſet neere the Northweſt, and ſhine neere 16. houres and a halfe. In the firſt minute of Leo, (deſcending towards the equinoctiall) as they did in Gemini. And in the ſigne of Virgo, as they did in Taurus. And in the firſt minute of Libra, Equinoctiall: beginning ſouth declination, as in Aries. And in the firſt minute of Scorpio, they riſe neere the Eaſt ſoutheaſt, and ſet neere the weſt ſouthweſt, and ſhine ten houres. In the firſt minute of Sagittarius, they riſe neere the ſoutheaſt and by eaſt, and ſet neare the Southeaſt and by weſt, and ſhine eight houres. In the firſt minute of Capricornus, they haue their greateſt declination to the ſouth, and begin to returne to the equinoctiall, riſing neere the ſoutheaſt, and ſetting neere the ſouthweſt, and ſhine ſeauen houres and a halfe. In the firſt minute of Aquarius, as in Sagittarius. In the firſt minute of Piſces, as in Scorpio.

To know when the Sunne riſeth and ſetteth.

By this meanes, you may know the time of the Sunnes riſing and ſetting in this manner. Diuide the time of the Sunnes ſhining, or continuance aboue the Horizon into two equall parts: the one part ſheweth the time of his ſetting: & it being ſubducted from 12. ſheweth the time of his riſing. As for example: Becauſe the Sunne being in Cancer, as is aforeſaid, ſhineth 16. houres and an halfe. Therefore I diuide that time into two equall parts (whereof the one is 8.

houres

houres and one quarter) and say that the Sunne setteth a quarter of an houre after eight, this number being subducted from 12, declareth the Sunne to arise three quarters after three in the morning.

To know when the Moone riseth and setteth.

Also by this rule you may knowe the time of the rising and setting of the Moone for euer. But before I say any more of that matter, heere is to be noted, that when the Moone changeth, then the Sunne and she are both in one degree of the ecliptick, and therefore they arise at one time, & vpon one point of the compasse, and continue aboue the Horizon both a like time. When the Moone is at the full, the Sunne and she are opposite one against the other, and sixe signes asunder, so that she ariseth at the same time when the Sunne setteth, and setteth when the Sunne ariseth, but vpon the contrary point of the compasse. And if the time of the continuance of the Sunne aboue the Horizon be subducted out of 24. houres, the remainder sheweth the continuance of the Moone aboue the Horizon. The quarters be when the Sunne and Moone are 3. signes asunder, that is 90. degrees. Moreouer frō the change of the Moone to the full, the moone ariseth after the Sunne, and setteth after him: But from the full to the change, the Moone ariseth and setteth before the Sunne. Therefore if at these intermiddle times betweene the change and the full, and the full and the change againe, you desire to know the time of the rising and setting of the Moone, note this: I haue shewed you before, speaking of the shifting of the Sunne and Moone, that euery day of the age of the Moone, the Moone goeth Eastward one point and three minutes, so that you must looke how many dayes the Moone is ould, then put so many points, and so many three minutes together, and conuert them into houres: if the number be lesser then twelue, it sheweth how long the Moone riseth after the Sunne. But if the said number be more then 12, cast away twelue, and the remainder sheweth how long the Moone ariseth before the Sunne. The

time

time of her arising being once knowen, the time of her setting is easily knowen. For as many houres as she continueth in the East aboue the Horizon before she commeth to the South, so many houres she continueth in the West before she setteth vnder the Horizon after she is past the South, as for example thus. In March alwayes the Sunne is in Aries, then the Moone being in hir first quarter, is fiue houres to the Eastward of the Sunne, then the Moone must needes be in Cancer. Then shineth the Moone in our Horizon 16. houres and a halfe, and is South at fiue of the clock, and shineth 8. houres and a quarter after 6. of the clock. So that she setteth at 2. of the clock and a quarter of an houre past, and riseth in the day 8. houres & a quarter before 6. of the clock, that is, at 9. of the clock, and 3. quarters of an houre past. Now at the last quarter in March, then the Moone must needes be in Capricornus, and shineth but 7. houres & a halfe, and is south at 6. of the clock in the morning, & riseth 3. houres & 3. quarters before, that is, at two of the clock and a quarter of an houre past in the morning, and she setteth by day at 9. of the clock, and 3. quarters of an houre past, and this rule will serue for euer, without any great errour. But yet there is a further matter for the exact doing, which is the latitude of the Moone from the head or taile of the Dragon.

Ensample of the moones rising & setting.

And now for to shew vnto you when that the Moone is with the head and the taile of the Dragon, as I haue in the third Chapter said vnto you, there are but few sea-men that doth know the Moones Theorickes, for they cannot tell whē that the Moone is in her swift or slow motion. So in lyke maner it is necessarie for to know the Moones Latitude from the line Ecliptick, & also of which side of the line Ecliptick, which is knowen by the head or taile of the Dragon. For whē that the Moone hath passed 90. degrees from the head of the Dragon, then the Moone hath Latitude 5. degrees vnto the North parts of the line Ecliptick, and also if that the Moone be 90. degrees from the Dragons taile, then the Moone hath latitude 5. degrees vnto the south parts of the line Ecliptick.

The Moone hath Latitude.

So

So that the Dragons head is no other thing, but the crossing or passing of the Moone from the South partes vnto the North part of the line Ecliptick. So in like manner the Dragons taile is the crossing or passing of the Moone ouer the line Ecliptick from the North part vnto the South parts of the line Ecliptick. The effects heere of is this, if the Moone doth come with the head or taile of the Dragon at her opposition or full, then she shall be Eclipsed because the shadow of the earth is seene vpon the Moone, and these Eclipses be generall throw the face of the whole earth, if that the Moone be aboue the Horizon. And in like manner, if that the Moone doth come with the head or taile of the Dragon at the coniunction or chaunge of the Moone, then the Sunne is eclipsed, for that the Moone commeth betweene the Sunne and the earth, but these eclipses are not generall, for that the Diameter of the earth is more then fiue times the Diameter of the Moone: and also the Moone commeth very neere vnto the earth in respect of the great distance that the Sunne is from the earth, so that the Sunne may be eclipsed in one place but not in another, which doth happen by the Moones Paralax, as afore I haue shewed &c. And now for to know where the Dragons head is, note this when that the Prime is one, then the Dragons head is in the first part of Aries, as the point of Auge is. But their motions are contrarie: For as the point of Auge is in Aries, and from thence commeth into Taurus, and so successiuely proceedeth through the 12. signes in 19. yeeres. So the Dragons head doth passe through the 12. signes in 19. yeeres backwards, for being in Aries, it commeth into Pisces, and thence into Aquaries, &c. So that in 9. yeeres & a halfe, the Dragons head is in Libra, and doth meete with the point of Auge, &c.

And now for to know the Moones Latitude, marke this, the Prime one, the Dragons heade is in Aries, whereby it may be inferred that the Moone in Cancer, is 90. Degrees from the Dragons head, and hath her farthest distance from the line Ecliptick, that is fiue degrees. So that the Moone

decline fiue degrees more vnto the Northwardes than the Sunne doth, and her whole declination is 28. degrees and a halfe from the Equinoctiall, touching the Dragons taile which is alwaies opposite vnto the Dragons head, the Prime being one, the Dragons taile is in Libra. Item the Moone passing Cancer, commeth nearer the Ecliptick, and in Libra, she crosseth the line Ecliptick, and when she is come into Capricorne, then she is fiue degrees vnto the Southwards of the line Eclipticke, and declineth 28. degrees and a halfe vnto the Southwards of the Equinoctiall. So that the Moone doth decline in all, (medling not with the Moones Paralare) 57. degrees the Prime being one, in nine yeares and a halfe, the Dragons head shal be in Libra, and the taile in Aries, and then the Moone in the signe of Libra, shall passe ouer the line Eclipticke from the South part to the North part. So that the Moone in the signe of Capricorne, is fiue degrees vnto the North of the line Eclipticke, and then she doth decline but 18. degrees and a halfe from the Equinoctiall to the South parts, and so in the signe of Aries, the Moone shall passe ouer the line Ecliptick from the North vnto the South and then in Cancer, the Moone is fiue degrees vnto the south of the line Eclipticke, and doth decline 18. degrees vnto the North parts of Equinoctiall, so that the Moones whole declination, is but 37. degrees. So when the Prime is one, the declination of the Moone is more by 20. degrees, then when the Prime is betweene nine and tenne yeares, and when the Prime is neare fiue, then the Dragons head is in Capricornus. And when the Prime is 14. or 15. the Dragons head is in Cancer. So that in 19. yeares the Dragons head doth passe through the twelue signes backwards.

Thus by knowing what the Prime is, you may knowe where the Dragons head is, and also the Dragons tayle, and then that knowen, you may know the Moones latitude from the line Eclipticke, and of which side: For when the Moone is in the Dragons head, then she passeth ouer from the South vnto the North part, but when she is with the Dragons taile

then

then she passeth ouer from the North vnto the South part of the line Ecliptick, and then when that the Moone is halfe way betweene the head and the tayle of the Dragon, then is she fiue degrees in Latitude from the line Ecliptick, that is to say, if that she come from the head of the Dragon, she is fiue degrees on the North side, if from the taile, then is she fiue degrees on the South side of the line Ecliptick, and this I do thinke sufficient for instruction. Heere (as before) I could wish that Sea-faring men or others, would not leane too much vnto these rules of the Prime concerning the finding out of the true place of the Dragons head or tayle, because they are vncertaine, but I would wish them to sticke vnto the Ephemerides, wherein to saue their labour these things are seuerally set downe with more certaintie.

Yet there is one thing which I would Sea-faring men should consider, although a great number be expert in that, yet it is meet to be spoken of, as this. The Sunne being in Cancer, or Moone in like manner, or in Gemini, or any time when the Sunne or Moone hath North declination, they will set their Compasse before them, & when they see the Sunne giue an East shadow, they wil say that it is six of the clocke whereas if the Sunne be in Cancer, it is not much past fiue of the clocke, and the farther they are to the Southwards, the more they do erre. And in like case the Moone being in Cancer, whē they do see the Moone giue an East shadow by their compasse, they wil say the Moone is West, but they do not consider, that the Sunne & the Moone being in Cancer, commeth to neare our Zenith, or verticall point right ouer our head, (which is the very height of their declination) that the position of their shadow can hardly be discerned, therefore they must iudge the east or west frō the pole or North star, if they wil iudge truly.

You cannot know what a clocke it is by the compasse, the Sunne being in the North signes.

Errour of the shadow of the Moone.

Wherefore I do much commend the Equinoctiall dyals for the exact truth, for they cannot know the truth by their Compasse, if that the Sunne or Moone, or any other starre, haue any great declinatiō, being in Cancer: and you must consider this in like maner. The Sun hauing North declination,

The Equinoctiall dials be very good.

the further you doe go to the Northwards, the longer is your day, and the shorter is your night, and towards the Southwards, the shorter daies and longer nights.

As touching the length and shortnesse of the day and night.

Now contrariwise, the Sunne hauing South declination, the more to the Northwards, the shorter daies and the longer nights, the further to the Southwards, the longer daies and shorter nights, and vnder the Equinoctiall, the nights and daies all one, what declination soeuer the Sunne hath: but this rule that I haue giuen you is for London, or any other place that hath North Latitude for the eleuation of the Pole Arcticke.

¶ The fift Chapter is of a Table of declination, commonly called of Sea-faring men, A Regiment of the Sunne, exactly calculated for foure yeares, and will serue for twentie foure yeeres, for euerie day of the moneth.

AND in like manner as I haue saide somewhat of the Moones motion, so I do thinke it conuenient for to say some what of the Sunnes motion, for that it is necessarie for Sea-men for to know, the Sunnes place in the Zodiacke, whereby that they may calculate or count the Sunnes declination truely, and as I haue shewed before, that the Sunne doth passe through the Zodiacke in 365. daies fiue houres. 55. minutes, 26. seconds, and hath three motions as the Moone hath. In the point of Auge is the Sunnes slow motions, and then the Sunne passeth or goeth but little more than 57. minutes in 24. houres, and in the opposition of Auge, the Sunne passeth or goeth one degree and neere two minutes in 24. houres, that is more by fiue minutes almost in his swift motion then in his slow motiō. The point of Auge is now in this age of the world in the signe of Cancer, but not in the Solstitiall poynt, where

where that the Sunne hath his greatest declination, and also the opposition of Auge is in Capricorne but not there where the sunne hath his greatest declination. Now by the meanes of the three motions of the sunne, it falleth out that the Equinoctiall points be not euen, for that there are more daies from the Equinoctiall of March, vnto the Equinoctiall of September, by neere nine dayes, then there is from the Equinoctiall of September, vnto the Equinoctiall of March, for that there is from the eleuenth day of March vnto the 14. day of September. 187. dayes, & there is but 178. daies from the 14. day of September, vnto the 11. day of March. And the reason is this as I haue said before, because that in the latter part of June the Sunne is in his slowe motion, and also in the latter part of December, hee is in his swift motion: & this I do thinke sufficient for instructions in this matter, for that the Sea-men haue no farther to do with the Sunnes motion, but onely from the true place of the Sunne to seeke the true declination of it: And also the most part of sea men haue vsed Spanish Regiments, and thinking that those would haue serued for euer, which is most contrarie, for if that it bee neuer so truely calculated, yet it groweth after twentie foure yeere vnto errour.

For as often as euery yeere of Bissextilis doth come about, which is euery foure yeere, the Sunne is sooner in the Equinoctiall by more than halfe an houre, &c.

Now shall follow a Table of declination or Regiment for foure yeeres, beyng calculated for the Longitude of 24. d. and will serue all Europe without much errour, or any other countrie or place that hath the same Longitude, as the most part of Africa, Ginnie, and those partes to the southwards, as farre as the Antartick Pole, seruing for euery day of the moneth, very necessarie for them that doe vse to trauaile either by sea or by land, & is one of the principall points in Nauigation, for long voiages; and the cause why I haue written this Regiment for the Sea, or Tables of declination, is for that I doe know that euery person that goeth vn-

Euery person cannot calculate the sunnes declination.

to the sea, as Master of a ship, hath not capacitie to calculate the sunnes declination, by the place of the Sunne, although they haue the Tables of declination, as the Ephemerides, or Martine Curteise, otherwise called the Art of Nauigation. Wherefore I haue written these notes, and Regiment or Table of declination for foure yeeres, and the first rowe towards your left hand, is the dayes of the moneth: the nert row, is the degrees of declination that the sunne hath at the instant time of noone: and the third row is the odde minutes of declination belonging to the degrees.

Two times in the yeere the Sũne hath declinatiõ. 1577.

Now there bee two times in the yeere that the sunne hath no declination, as this: For the first yeere after Bissextilis, (which is in the yeere of our Lord 1601. the 10. day of March, betweene 8. and 9. of the clocke at night) the sunne will be in the Equinoctiall beginning North declination. And in likemanner the 13. day of September betweene 9. and 10. a clocke, the Sunne wilbe in the Equinoctiall beginning south declination, and also the second yeere after Bissextilis, which is the yeere of our Lord 1602. the sunne is in the Equinoctiall 11. day of March, betweene 2. and 3. of the clocke before noone, beginning North declination, and in like manner the 13. day of September betweene 3. and 4. of the clocke in the after noone, beginning South declination.

Furthermore, in the third yeere after Bissextilis which is the yeere of our Lord 1603. the sunne is in the Equinoctiall the 11. day of March, betweene 8. and 9. of the clocke in the morning, beginning North declination, and so in lyke manner the 13. daie of September betweene 9. and 10. of the clocke at night, beginning South declination.

Lastly in the yeere of our Lord 1600. that is, the yeere Bissextilis it selfe. Upon the 10. day of March, the sunne shal be in the Equinoctiall about 3. of the clocke after noone, beginning North declination: and in like manner the 13. day of September, betweene 3. and 4. of the clocke in the morning,

morning, beginning South declination: Now these foure yeeres being expired you must begin againe at the yeere Bissextilis or leape yeere, as here doth follow for example. And so it will serue for neere twentie yeeres to come.

Yeere 1	Yeere 2	Yeere 3	Yeere Bissextilis
1597	1598	1599	1600
1601	1602	1603	1604
1605	1606	1607	1608
1609	1610	1611	1612
1613	1614	1615	1616

To the Reader of this Regiment.

GEntle Reader I haue painefully and truely calculated this Regiment for your vſe, and deſire you to perſwade your ſelfe ſo. If it ſhall ſeeme otherwiſe, eyther it ſo falleth out by meanes of your obſeruation, or in reſpect of the place, in which you are, which may alter the place of the Sunne and conſequently his declination diuerſly. Therefore if your expectation in ſearching the eleuation of the Pole by this Regiment be not fully anſweared, let not my labour bee vnaduiſedly reprooued leaſt I be diſcouraged, but let the fault remayne where it is. In my Booke called the Mariners eaſe which is ſhortly to come foorth, beſides many things els fitte for your vſe, you ſhall haue an ample Table of the Sunnes declination calculated for euery degree and minute of the Eclipticke, By the which Table you ſhalbe ſufficiently and plainely inſtructed how to finde out the declination of the Sunne in any place where ſoeuer you are.

Vntill then I reſt yours

T. Hood.

1600. The Bissextile or Leape yeere.

Ianuarie.			South.	Februarie.			South Declination. The Sunne in the Equinoctiall. North Declination.	March.			Declination.
D.	G.	M.		D.	G.	M.		D.	G.	M.	
1	21	57		1	14	16		1	3	36	
2	21	48		2	13	57		2	3	12	
3	21	38		3	13	36		3	2	49	
4	21	28		4	13	17		4	2	25	
5	21	18		5	12	56		5	2	1	
6	21	7		6	12	35		6	1	38	
7	20	55		7	12	15		7	1	14	
8	20	43		8	11	53		8	0	50	
9	20	31		9	11	32		9	0	27	
10	20	18		10	11	11		10	0	3	
11	20	6		11	10	49		11	0	20	
12	19	52		12	10	28		12	0	44	
13	19	38		13	10	6		13	1	8	
14	19	24		14	9	44		14	1	31	
15	19	10		15	9	22		15	1	55	
16	18	55		16	8	59		16	2	18	
17	18	40		17	8	37		17	2	42	
18	18	25		18	8	14		18	3	6	
19	18	9		19	7	52		19	3	29	
20	17	53		20	7	29		20	3	52	
21	17	36		21	7	6		21	4	15	
22	17	19		22	6	43		22	4	39	
23	17	2		23	6	20		23	5	2	
24	16	35		24	5	56		24	5	45	
25	16	27		25	5	33		25	5	48	
26	16	9		26	5	10		26	6	10	
27	15	51		27	4	47		27	6	33	
28	15	33		28	4	23		28	6	56	
29	15	14		29	4	0		29	7	18	
30	14	55						30	7	41	
31	14	36						31	8	3	

1600. The Bissextile or Leape yeere.

Aprill.				Maie.				Iune.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	8	25		1	17	58		1	23	9
2	8	47		2	18	13		2	23	13
3	9	8		3	18	28		3	23	16
4	9	30	North.	4	88	42	North.	4	23	20
5	9	52		5	18	57		5	23	22
6	10	13		6	19	11		6	23	25
7	10	34		7	19	24		7	23	26
8	10	55		8	19	38		8	23	28
9	11	16		9	19	51		9	23	29
10	11	37		10	20	3		10	23	29
11	11	57		11	20	16	Solstice.	11	23	30
12	12	17		12	20	28		12	23	30
13	12	38		13	20	39		13	23	29
14	12	57		14	20	50		14	23	28
15	13	17		15	21	1		15	23	27
16	13	36		16	21	12		16	23	25
17	13	56		17	21	22		17	23	23
18	14	14		18	21	32		18	23	20
19	14	33		19	21	41		19	23	17
20	14	52	Declination.	20	21	50	Declination.	20	23	13
21	15	10		21	21	59		21	23	9
22	15	28		22	22	7		22	23	5
23	15	46		23	22	15		23	23	1
24	16	3		24	22	23		24	22	55
25	16	20		25	22	30		25	22	50
26	16	37		26	22	37		26	22	44
27	16	54		27	22	43		27	22	38
28	17	10		28	22	49		28	22	31
29	17	26		29	22	55		29	22	24
30	17	42		30	23	0		30	22	17
				31	23	5				

1600. The Bissextile or Leape yeere.

Iuly.				Auguſt.				September		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	22	9	North.	1	15	17	North Declination.	1	4	32
2	22	1		2	14	58		2	4	8
3	21	52		3	14	40		3	3	45
4	21	43		4	14	22		4	3	21
5	21	34		5	14	3		5	2	58
6	21	24		6	13	44		6	2	35
7	21	14		7	13	25		7	2	12
8	21	3		8	13	5		8	1	49
9	20	53		9	12	46		9	1	25
10	20	41		10	12	26	Sunne in the	10	1	2
11	20	30		11	12	6	Equinoctial.	11	0	39
12	20	18		12	11	46		12	0	15
13	20	6		13	11	26		13	0	8
14	19	54		14	11	5		14	0	32
15	19	41		15	10	44		15	0	55
16	19	27		16	10	23		16	1	19
17	19	14		17	10	2		17	1	42
18	19	0		18	9	41		18	2	6
19	18	46		19	9	20		19	2	29
20	18	32		20	8	58		20	3	53
21	18	17		21	8	37		21	3	16
22	18	2		22	8	15		22	4	39
23	17	46		23	7	52		23	4	2
24	17	31		24	7	30		24	4	26
25	17	15		25	7	9		25	5	49
26	16	59		26	6	46		26	5	12
27	16	43		27	6	24		27	5	35
28	16	26		28	6	1		28	5	58
29	16	8		29	5	39		29	6	21
30	15	51		30	5	15		30	6	44
31	15	34	Declination.	31	4	53	South Declination.			

1600. The Bissextile or Leape yeere.

October.				November				December.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	7	7		1	17	32		1	23	5
2	7	29		2	17	48		2	23	9
3	7	52		3	18	4		3	23	13
4	8	14	South.	4	18	20	South.	4	23	17
5	8	37		5	18	36		5	23	20
6	8	59		6	18	51		6	23	23
7	9	21		7	19	5		7	23	25
8	9	43		8	19	20		8	23	27
9	10	5		9	19	34		9	23	28
10	10	26		10	19	48		10	23	29
11	10	48		11	20	1	Solstice.	11	23	30
12	11	9		12	20	14		12	23	29
13	11	30		13	20	27		13	23	29
14	11	51		14	20	39		14	23	28
15	12	12		15	20	51		15	23	27
16	12	33		16	21	3		16	23	25
17	12	53		17	21	14		17	23	22
18	13	13		18	21	24		18	23	19
19	13	33	Declination.	19	21	35	Declination.	19	23	16
20	13	53		20	21	44		20	23	12
21	14	13		21	21	54		21	23	8
22	14	32		22	22	3		22	23	3
23	14	52		23	22	12		23	22	58
24	15	10		24	22	20		24	22	52
25	15	29		25	22	28		25	22	46
26	15	47		26	22	35		26	22	39
27	16	5		27	22	42		27	22	33
28	16	23		28	22	48		28	22	25
29	16	41		29	22	54		29	22	17
30	17	58		30	23	0		30	22	9
31	17	15						31	22	0

1601. The first yeere after the Leape yeere.

Ianuarie.				Februarie.				Macrh.		
D.	G.	M.		D.	G	M.		D.	G.	M.
1	21	50		1	14	1		1	3	42
2	21	41		2	13	41		2	3	18
3	21	31		3	13	21		3	2	54
4	21	20	South.	4	13	1	South Declination,	4	2	31
5	21	9		5	12	40		5	2	7
6	20	58		6	12	20		6	1	43
7	20	46		7	11	59		7	1	20
8	20	34		8	11	38		8	0	56
9	20	22		9	11	16		9	0	33
10	20	9		10	10	54	Sunne in the	10	0	9
11	19	56		11	10	33	Equinoctial.	11	0	15
12	19	42		12	10	11		12	0	38
13	19	28		13	9	49		13	1	2
14	19	14		14	9	27		14	1	26
15	18	59		15	9	5		15	1	49
16	18	44		16	8	42		16	2	13
17	18	28		17	8	20		17	2	36
18	18	13		18	7	57		18	3	0
19	17	57		19	7	34		19	3	23
20	17	40		20	7	11		20	3	46
21	17	24		21	6	48		21	4	9
22	17	6		22	6	25		22	4	33
23	16	49		23	6	2		23	4	56
24	16	32		24	5	39		24	5	19
25	16	14		25	5	16		25	5	42
26	15	56		26	4	52		26	6	5
27	15	37		27	4	28		27	6	27
28	15	18		28	4	6		28	6	50
29	15	0						29	7	13
30	14	40						30	7	35
31	14	21						31	7	57

Declination. North Declination.

1601. The first after the Leape yeere.

Aprill.				Maie.				Iune.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	8	19		1	17	54		1	23	8
2	8	41		2	18	9		2	23	12
3	9	3	North.	3	18	24	North.	3	23	16
4	9	25		4	18	39		4	23	19
5	9	46		5	18	53		5	23	22
6	10	8		6	19	7		6	23	24
7	10	29		7	19	21		7	23	26
8	10	50		8	19	34		8	23	28
9	11	11		9	19	47		9	23	29
10	11	31		10	20	0		10	23	29
11	11	52		11	20	13	Solstice	11	23	30
12	12	12		12	20	29		12	23	30
13	12	32		13	20	36		13	23	29
14	12	52		14	20	48		14	23	28
15	13	12		15	20	59		15	23	27
16	13	31		16	21	9		16	23	25
17	13	50		17	21	20		17	23	23
18	14	10		18	21	29		18	23	21
19	14	28	Declination.	19	21	39	Declination.	19	23	18
20	14	47		20	21	48		20	23	14
21	15	5		21	21	57		21	23	10
22	15	23		22	22	5		22	23	6
23	15	41		23	22	14		23	23	2
24	15	58		24	22	21		24	22	57
25	16	16		25	22	28		25	22	51
26	16	33		26	22	35		26	22	45
27	16	49		27	22	47		27	22	39
28	17	6		28	22	42		28	22	33
29	17	22		29	22	53		29	22	26
30	17	34		30	22	59		30	22	18
				31	23	3				

1601. The first yeere after the Leape yeere.

Iulie.			North.	August.			North Declinatiõ, Sunne in the Equinoctial. South Declination.	Septẽber.		
D.	G.	M.	Declination.	D.	G.	M.		D.	G.	M.
1	22	10		1	15	21		1	4	36
2	22	3		2	15	3		2	4	13
3	21	54		3	14	44		3	3	50
4	21	45		4	14	26		4	3	27
5	21	36		5	14	7		5	3	4
6	21	26		6	13	48		6	2	41
7	21	17		7	13	30		7	2	18
8	21	6		8	13	10		8	1	54
9	20	55		9	12	51		9	1	31
10	20	44		10	12	31		10	1	8
11	20	33		11	12	11		11	0	44
12	20	21		12	11	51		12	0	21
13	20	9		13	11	31		13	0	3
14	19	57		14	11	10		14	0	26
15	19	44		15	10	49		15	0	49
16	19	31		16	10	29		16	1	13
17	19	17		17	10	8		17	1	36
18	19	3		18	9	46		18	2	0
19	18	50		19	9	25		19	2	23
20	18	35		20	9	4		20	2	47
21	18	20		21	8	42		21	3	10
22	18	6		22	8	20		22	3	34
23	17	50		23	7	58		23	3	57
24	17	35		24	7	36		24	4	20
25	17	19		25	7	14		25	4	43
26	17	3		26	6	52		26	5	7
27	16	47		27	6	30		27	5	30
28	16	30		28	6	7		28	5	53
29	16	13		29	5	44		29	6	15
30	15	56		30	5	22		30	6	38
31	15	38		31	4	59				

1601. The first after the Leape yeere.

October.				November.				December.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1.	7	1	South.	1	17	28	South.	1	23	3
2	7	24		2	17	44		2	23	8
3	7	46		3	18	0		3	23	12
4	8	9		4	18	16		4	23	16
5	8	31		5	18	32		5	23	20
6	8	54		6	18	47		6	23	23
7	9	16		7	19	2		7	23	25
8	9	38		8	19	16		8	23	27
9	9	59		9	19	31		9	23	28
10	10	21		10	19	44		10	23	29
11	10	43		11	19	58	Solstice	11	23	30
12	11	4		12	20	11		12	23	30
13	11	25		13	20	24		13	23	29
14	11	46		14	20	36		14	23	28
15	12	7		15	21	48		15	23	27
16	12	28		16	21	0		16	23	25
17	12	48		17	21	11		17	23	23
18	13	8		18	21	22		18	23	20
19	13	29		19	21	32		19	23	17
20	13	48		20	21	42		20	23	13
21	14	8		21	21	52		21	23	9
22	14	28		22	22	1		22	23	4
23	14	47		23	22	10		23	22	59
24	15	6		24	22	18		24	22	54
25	15	24		25	22	26		25	22	47
26	15	43		26	22	33		26	22	41
27	16	2		27	22	40		27	22	34
28	16	19		28	22	47		28	22	27
29	16	36		29	22	53		29	22	19
30	16	54		30	22	58		30	22	11
31	17	11	Declination.				Declination.	31	22	2

1602. The ſecond after the Leape yeere.

Ianuarie.				Februarie.				March.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	21	53	South.	1	14	6	South Declination.	1	3	48
2	21	43		2	13	47		2	3	24
3	21	33		3	13	27		3	3	0
4	21	23		4	13	6		4	2	37
5	21	12		5	12	46		5	2	13
6	21	1		6	12	35		6	1	49
7	20	49		7	12	4		7	1	26
8	20	37		8	11	43		8	1	2
9	20	25		9	11	22		9	0	39
10	20	12		10	11	0	Sunne in the	10	0	15
11	19	59		11	10	39	Equinoctial.	11	0	90
12	19	45		12	10	17		12	0	33
13	19	31		13	9	55		13	0	56
14	19	17		14	9	33		14	1	20
15	19	3		15	9	10		15	1	43
16	18	48		16	8	48		16	2	7
17	18	33		17	8	26		17	2	30
18	18	17		18	8	3		18	2	54
19	18	1		19	7	40		19	3	17
20	17	45	Declination.	20	7	17	North Declination.	20	3	41
21	17	28		21	6	54		21	4	4
22	17	11		22	6	31		22	4	27
23	16	54		23	6	8		23	4	50
24	16	36		24	5	45		24	5	13
25	16	19		25	5	21		25	5	36
26	16	1		26	4	58		26	5	59
27	15	42		27	4	35		27	6	22
28	15	23		28	4	11		28	6	45
29	15	4						29	7	7
30	14	46						30	7	29
31	14	26						31	7	52

1602. The ſecond after the Leape yeere.

Aprill.				Maie.				Iune.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	8	14		1	17	50		1	23	7
2	8	36		2	18	5		2	23	11
3	8	58		3	18	20		3	23	14
4	9	20	North.	4	18	35	North.	4	23	18
5	9	41		5	18	50		5	23	21
6	10	2		6	19	4		6	23	23
7	10	24		7	19	18		7	23	25
8	10	45		8	19	31		8	23	27
9	11	6		9	19	44		9	23	28
10	11	26		10	19	57		10	23	29
11	11	47		11	20	9	Solſtice.	11	23	30
12	12	7		12	20	22		12	23	30
13	12	27		13	20	34		13	23	29
14	12	47		14	20	45		14	23	28
15	13	7		15	20	56		15	23	27
16	13	27		16	21	7		16	23	26
17	13	46		17	21	17		17	23	24
18	14	5		18	21	27		18	23	21
19	14	24		19	21	37		19	23	18
20	14	42	Declination.	20	21	46	Declination.	20	23	15
21	15	1		21	21	55		21	23	11
22	15	19		22	22	3		22	23	22
23	15	37		23	22	11		23	23	3
24	15	54		24	22	19		24	22	58
25	16	12		25	22	27		25	22	53
26	16	29		26	22	34		26	22	47
27	16	45		27	22	40		27	22	41
28	17	2		28	22	46		28	22	34
29	17	18		29	22	52		29	22	28
30	17	34		30	22	57		30	22	20
				31	23	2				

1602. The ſecond after the Leape yeere.

July.				August.				September		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	22	13	North.	1	15	25	North Declination.	1	4	42
2	22	5		2	15	7		2	4	19
3	21	56		3	14	49		3	3	56
4	21	47		4	14	31		4	3	33
5	21	38		5	14	12		5	3	10
6	21	29		6	13	53		6	2	47
7	21	19		7	13	34		7	2	23
8	21	9		8	13	15		8	2	18
9	20	58		9	12	55		9	1	37
10	20	47		10	12	36	Sunne in the	10	1	13
11	20	36		11	12	16	Equinoctial.	11	0	50
12	20	24		12	11	56		12	0	27
13	20	12		13	11	36		13	0	3
14	20	0		14	11	15		14	0	20
15	19	47		15	10	54		15	0	44
16	19	34		16	10	34		16	1	7
17	19	21		17	10	13		17	1	31
18	19	7		18	9	51		18	1	54
19	18	53		19	9	30		19	2	18
20	18	39	Declination.	20	9	9	South Declination.	20	2	41
21	18	24		21	8	47		21	3	4
22	18	9		22	8	26		22	3	28
23	17	54		23	8	4		23	3	51
24	17	39		24	7	42		24	4	14
25	17	23		25	7	20		25	4	37
26	17	7		26	6	57		26	5	1
27	16	51		27	6	35		27	5	24
28	16	34		28	6	13		28	5	47
29	16	17		29	5	50		29	6	10
30	16	0		30	5	27		30	6	33
31	15	43		31	5	5				

October.				November.				December.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	6	55	South.	1	17	24	South.	1	23	2
2	7	18		2	17	40		2	23	7
3	7	41		3	17	56		3	23	11
4	8	3		4	18	12		4	23	15
5	8	26		5	18	28		5	23	19
6	8	48		6	18	43		6	23	22
7	9	10		7	18	58		7	23	24
8	9	32		8	19	13		8	23	26
9	9	54		9	19	27		9	23	28
10	10	16		10	19	41		10	23	29
11	10	37		11	19	55	Solstice.	11	23	30
12	10	59		12	20	8		12	23	30
13	11	20		13	20	21		13	23	29
14	11	41		14	20	33		14	23	28
15	12	2		15	20	45		15	23	27
16	12	23		16	20	57		16	23	26
17	12	43		17	21	8		17	23	24
18	13	3		18	21	19		18	23	21
19	13	24		19	21	30		19	23	18
20	13	43		20	21	40		20	23	14
21	14	3		21	21	49		21	23	10
22	14	23		22	21	59		22	23	5
23	14	42		23	22	7		23	23	0
24	15	1		24	22	16		24	22	55
25	15	20		25	22	24		25	22	49
26	15	38		26	22	31		26	22	43
27	15	56		27	22	38		27	22	36
28	16	15		28	22	45		28	22	29
29	16	32		29	22	51		29	22	21
30	16	49		30	22	57		30	22	13
31	17	7						31	22	4

Declination. Declination.

1603. The third yeere after the Leape yeere.

Ianuarie.				Februarie.				March.		
D.	G.	M.		D	G	M.		D.	G.	M.
1	21	55	South.	1	14	11	South Declinatiõ, Sunne in the Equinoctial. North Declination.	1	3	53
2	21	46		2	13	51		2	3	30
3	21	36		3	13	31		3	3	6
4	21	25		4	13	11		4	2	43
5	21	15		5	12	51		5	2	19
6	21	4		6	12	30		6	1	55
7	20	52		7	12	9		7	1	32
8	20	40		8	11	48		8	1	8
9	20	28		9	11	27		9	0	44
10	20	15		10	11	5		10	0	21
11	20	2		11	10	44		11	0	3
12	19	49		12	10	22		12	0	27
13	19	35		13	10	0		13	0	50
14	19	21		14	9	38		14	1	14
15	19	6		15	9	16		15	1	37
16	18	51		16	8	54		16	2	1
17	18	36		17	8	31		17	2	25
18	18	21		18	8	8		18	2	48
19	18	5		19	7	46		19	3	12
20	17	48		20	7	24		20	3	35
21	17	32		21	7	0		21	3	58
22	17	15		22	6	37		22	4	21
23	16	58		23	6	14		23	4	44
24	16	41		24	5	51		24	5	7
25	16	23		25	5	27		25	5	30
26	16	5		26	5	4		26	5	53
27	15	47		27	4	41		27	6	16
28	15	28		28	4	17		28	6	39
29	15	9						29	7	1
30	14	50						30	7	24
31	14	31						31	7	46

1603. The third after the Leape yeere.

Aprill.				Maie.				Iune.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	8	9	North.	1	17	46	North.	1	23	6
2	8	30		2	18	1		2	23	10
3	8	52		3	18	17		3	23	14
4	9	14		4	18	32		4	23	17
5	9	36		5	18	46		5	23	20
6	9	57		6	19	0		6	23	23
7	10	18		7	19	14		7	23	25
8	10	40		8	19	28		8	23	27
9	11	1		9	19	41		9	23	28
10	11	21		10	19	54		10	23	29
11	11	42		11	20	6	Solstice	11	23	30
12	12	2		12	20	19		12	23	30
13	12	23		13	20	31		13	23	29
14	12	42		14	20	42		14	23	28
15	13	2		15	20	53		15	23	27
16	13	22		16	21	4		16	23	26
17	13	41		17	21	15		17	23	24
18	14	0		18	21	25		18	23	22
19	14	19		19	21	34		19	23	19
20	14	38		20	21	44		20	23	16
21	14	56		21	21	53		21	23	12
22	15	14		22	22	1		22	23	8
23	15	32		23	22	10		23	23	4
24	15	50		24	22	17		24	22	59
25	16	7		25	22	25		25	22	54
26	16	25		26	22	32		26	22	48
27	16	41		27	22	39		27	22	42
28	16	58		28	22	45		28	22	36
29	17	14		29	22	51		29	22	29
30	17	30		30	22	56		30	22	22
				31	23	1				

Declination.

Declination.

1603. The third yeere after the Leape yeere.

Iulie.				August.				September.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	22	14		1	15	29		1	4	48
2	22	7		2	15	11		2	4	24
3	21	58		3	14	53		3	4	1
4	21	50		4	14	35		4	3	38
5	21	40		5	14	16		5	3	15
6	21	31		6	13	58		6	2	52
7	21	21		7	13	39		7	2	26
8	21	11		8	13	19		8	2	6
9	20	1		9	13	0		9	1	42
10	20	50		10	12	41		10	1	19
11	20	38		11	12	20		11	0	56
12	20	27		12	12	1		12	0	32
13	20	15		13	11	41		13	0	9
14	19	3		14	11	20		14	0	14
15	19	50		15	10	59		15	0	38
16	19	37		16	10	39		16	1	1
17	19	24		17	10	18		17	1	25
18	19	10		18	9	57		18	1	48
19	18	56		19	9	35		19	2	12
20	18	42		20	9	14		20	2	35
21	18	28		21	8	52		21	2	58
22	18	13		22	8	31		22	3	22
23	17	58		23	8	9		23	3	45
24	17	42		24	7	47		24	4	9
25	17	27		25	7	25		25	4	32
26	16	11		26	7	3		26	4	55
27	16	55		27	6	41		27	5	18
28	16	38		28	6	18		28	5	41
29	16	21		29	5	56		29	6	4
30	16	4		30	5	33		30	6	27
31	15	47		31	5	10				

North Declination, Sunne in the Equinoctial. South Declination.

1603. The third after the Leape yeere.

October.				November.				December.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	6	50	South.	1	17	20	South.	1	23	1
2	7	13		2	17	36		2	23	6
3	7	35		3	17	52		3	23	10
4	7	58		4	18	9		4	23	14
5	8	20		5	18	24		5	23	18
6	8	42		6	18	40		6	23	21
7	9	5		7	18	54		7	23	24
8	9	27		8	19	9		8	23	26
9	9	49		9	19	21		9	23	28
10	10	10		10	19	38		10	23	29
11	10	32		11	19	51	Solstice	11	23	29
12	10	53		12	20	5		12	23	30
13	11	15		13	20	11		13	23	30
14	11	36		14	20	30		14	23	29
15	11	57		15	20	42		15	23	28
16	12	18		16	20	54		16	23	26
17	12	38		17	21	5		17	23	24
18	12	59		18	21	16		18	23	22
19	13	19	Declination.	19	21	27	Declination.	19	23	19
20	13	39		20	21	37		20	23	15
21	13	59		21	21	47		21	23	11
22	14	18		22	21	56		22	23	7
23	14	37		23	22	5		23	23	2
24	14	56		24	22	14		24	22	56
25	15	15		25	22	22		25	22	51
26	15	34		26	22	30		26	22	44
27	15	52		27	22	37		27	22	38
28	16	10		28	22	43		28	22	31
29	16	28		29	22	50		29	22	23
30	16	45		30	22	56		30	22	15
31	17	3						31	22	6

¶ The sixt Chapter sheweth how to take the height of the Sunne with the Crosse staffe, or with the Astrolobe, and also how to find the true Meridian, with other necessarie matters.

TO take the true height of the Sunne at the Sea, the best way is, to doe it with the Crosse staffe, for that the Sea is moueable, and causeth the ship to heaue and set little or much. And also vpon the Crosse staffe the degrees bee larger marked than the Ring or Astrolobe: and in a large instrument, an errour is seene sooner and better, than it is in a small instrument.

Now to take the height of the sunne, to know the Altitude of the Pole aboue the Horizon, do this: first set the sunne with a Compasse to know when he commeth neere vnto the Meridian: as soone as you see that the Sunne is come vnto the South & by East, then begin to take his height with the Crosse staffe, in this manner: Put the Transuersarie vpon the long staffe, then set the end of the long staffe close at the corner of your eye, winking with your other eye, and remouing the Transuersarie forewards or backwards, till you do see the lower end of it (being iust with the Horizon) and the vpper end of it, (being iust with the middle of the Sunne) both to agree with the Sunne and the Horizon at one time: and so haue you the true height of the sunne. This done, still obserue the same, vntill you see the sunne at the heighest, and beginning to descend, then haue you finished.

How to obserue the Sun.

To take the height of the Sunne with the crosse staf.

Yet notwithstanding this is to be noted: that it is best to take the height of the Sunne with the Crosse staffe, when the sunne is vnder fiftie degrees in height aboue the Horizon, for two causes. The one is this: vntill you come to 50. degrees, the degrees be largely marked vpon the crosse staffe, but after 50. degrees they be lesser marked then the other are. Againe, the Sunne being vnder 50. degrees in height, you may easely take the height, because you may easely see

The causewhy the crosse staffe is best to take the height of the Sun vnder 50. degrees.

or view to the vpper ende and the neather ende of the Crosse staffe both at one time: but if it doth exceede 50. degrees, then by the meanes of casting your eye vpwards and downewards so much, you may soone commit errour, and then in like manner, the degrees be so small marked, that if the sunne doth passe 50. or 60. degrees in height, you must leaue the crosse staffe, and vse the Mariners Ring, called by them the, Astrolaby.

To take the height of the Sunne with the Astrolaby. How to correct your Astrolaby if it doth not hang vpright.

Now to take the height of the Sunne with the common Ring or Astrolabie, doe thus: The Sunne beyng (as before is declared) neere the Meridian or South, obserue it (vntill you haue the greatest height thereof) in this maner: Holde the Ringe of the Astrolabie vpon one of your fingers, and turne the Alhidada vp and downe, vntill you see the shadow of the Sunne pearce or passe through both the sights therof, being sure that the Astrolabie doth hang vpright, which you may proue in this manner.

Looke at how many degrees and minutes the Alhidada doth stande vpon the Astrolabie, then tourne the Alhidada vnto the same number of the degrees and minutes on the other side of the Astrolabie, and then taking the height of the sunne againe, if it doe agree as it did before, then the Astrolabie, doth hange vpright: but if it doe not, then it doth not hang vpright. For knowledge of the true height of the sunne (the Astrolabie not hanging vpright) do thus: If the Astrolabie be truly marked, marke the diuersitie, that being knowen, rebate from the greatest height halfe the diuersitie, or elle adde vnto the lesser height halfe the diuersitie, & that shall be the true height of the Sunne, although that the Astrolabie doth not hang vpright.

The Astrolaby is best to take the height of the sūne at 60. 70. or 80. degrees in height.

The Astrolabie is best to take the height of the Sunne, if the sunne be very high, at 60. 70. or 80. degrees: and the cause is this: The sunne comming neere vnto your Zenith, hath great power of light, for to pearce the two sights of the Alhidada of the Astrolabie, and then it is not good to vse the crosse staffe, for that the sunne hurteth the eies of a man, & besides that,

that, it is too high to occupy the crosse staffe, (as before is declared) so that this way you may very much preserue your eyes. If you haue not glasses vpon your staffe (to saue your eies in taking the height of the Sunne) but be vnprouided of them, do this: take and couer the sunne with the end of the Transuersarie of the crosse staffe, vnto the very vpper edge or brinke of the sunne, (so shal you not need to behold the brightnesse of it) and with the other ende of the Transuersarie to take the Horizon truely, and that being done, because the Sunne is 30. or 31. minutes in Diameter or breadth, therefore you shall rebate 15. minutes from the Altitude or height of the Sunne, and then that which shall remaine, shal be the true height of the Sunne, from the Centre or middle of the Sunne. And furthermore, there is some errour in the taking the sunne or starre with the Ballastell or Crosse staffe, and that groweth by this meanes: for that the true Centre (which is the sight of the eye) is within in the middle of the eye, and not in the outside of the eye: so that the end of the long staffe in the setting of it vnto the corner of your eie, doth stand somewhat further out then the sight of your eye, that is to say, that the sight of the eye is somewhat further into the head, than the end of the staffe doth come vnto: wherefore you must pare away a little of the end of the staffe, for some mens vses more, and some mens vses lesse, for that it is according as you may set the staffe vnto your eye, for some men need pare away little or nothing, and some men must pare away 14. or 15. minutes, as you may set the staffe, because some mens eyes be further into their head, than other some mens are, and the bones of some mens face stand further out then other some doe.

How to perserue your eies when you touch the Sun with the crosse staffe, and haue no glasses.

The Diameter of the Sun is 30. or 31. minutes.

Some error in the crosse staffe and how to reforme it.

It is moreouer conuenient to knowe the Meridian or south, which you must doe eyther with a good Compasse, or with a perfect Diall or Needle: but if you bee on the land, this you may doe, on a peece of timber or any other thing that standeth fast; with a payre of compasses make a circle, then in the middle or center where the foote of the cõpasse did stand,

To get the true Meridian vpon the land.

set a wier vpright (as circumspectly as you can) and then you may doe this: looke in the morning (so it be on plaine groũd, that you may see the Horizon circle, without any lette at the Sunne rising, for the shadow of the wire) and there set a prick: then at the setting of the Sunne you shall set another pricke, euen at the circumference of the circle, then deuide that with your compasses euen in two peeces, and strike a straight line from the wyre or center of the circle, to the middle or diuided pricke, and that shall bee the true Meridian. Or else (the wyer standing vpright) first in the forenoone when the toppe of the wyer doth touch, or is readie to come into the circumference or edge of the circle, there make a pricke: then in the afternoone in like manner, where the shadowe of the wyar toucheth the edge of the Circle, there make an other pricke euen with the end out of the shadow: this done (as circũspectly as you can) deuide these two pricks in the middle, then as is before said, draw a line from the center or wyer, to the middle pricke, and that shadow shall bee your true Meridian.

After an other manner you may do this: looke and watch when the wier giueth the shortest shadow, and there make a pricke, then draw a line from that pricke to the wyer, which shall be the true Meridian.

And yet furthermore, for that it is most conuenient to know the true Meridian at the sea, because in long voiages, going farre vnto the Westward or Eastward, the compasse doth varie: to find the true Meridian, do this. Set the sunne with your compasse at hir rising or appearing aboue the Horizon, and then (knowing what point and part of the sunne doth ryse at) set the Sunne with your Compasse at the setting or departing vnder the Horizon, and (that being knowen) you shall perfectly know whether the Compasse bee varied, and how much, by the diuiding the peece of the circle cõtained betweene the rising and setting of the sunne into two equal parts, for the right line drawne frõ the center of the flie thorough ẏ point of the partitiõ expresseth ẏ true Meridian, and

To know the true Meridian at the Sea, and also if your compasse be varied, and to know how much they be varied.

and the proportion of the circle contained betweene the said line and the South point of your compasse sheweth the quantitie of the variation. For ensample this, I do set the Sunne at his rising with the compasse, and he doth rise vpon the East point: in like manner also I do set the Sunne with the compasse at her setting, and do finde her to set West Northwest: so I doe see the compasse to be varied one point, that is to say, the North point doth stand North and by East, &c. And furthermore, (for that seldome times the Sunne doth rise and set cleere by the meanes of the clouds, and other impediments next the Horizon) you may get the true Meridian thus: at any time in the forenoone, first set the Sunne with your compasse, and then take the true height of the Sunne.

Now you (knowing how many degrees the Sunne was high at that point of the compasse) you may in like manner obserue the Sunne in the afternoone, vntill you do finde the Sunne iust at that height that it was in the forenoone, marking at what point of the compasse the Sunne is, and so shall ye see perfectly whether the compasse be varied or no, and also how much: for ensample thus, I take the Sunne vpon the Southeast point 20. degrees aboue the Horizon, and then in the afternoone, I doe obserue the Sunne vntill such time as I doe find the Sunne iust 20. degrees aboue the Horizon againe, and then I set the Sunne with the compasse, and doe finde the Sunne to be at 20. degrees in height West south west, so that I see the compasse to be varied one point, that is to say, the Noth point doth stand North and by East, &c.

An other way also to know the true Meridian by the Sunne is this: to set the Sunne with the compasse at her greatest height aboue the Horizon, and so you shall know whether the compasse be varied, and how much: and looke what is spoken of the Sunne by day, you may doe the like by night by any of the stars that you perfectly do know, doing as you do by the Sunne in all points: but you cannot do it so well and truely by the Moone, by the meanes of the swiftnesse of her motion in the Zodiacke. you may also finde the variation by the com-

To finde the variation of the compasse in the night by the stars, but not by the Moone.

passe the Northstarre, as thus: set the Northstarre with the compasse, if the North point doe stand right with the starre, then it is not varied, but if it doth not stand with the starre, then it is varied: and that must be done when the two starres of Charles waine called the pointers, be right vnder, or right ouer the Northstarre, but if that the starres be West from the Northstarre, then the Northstarre is the third part of a point vnto the Eastwarde of the North Pole. If the two starres of Charles wayne, called the poynters, be due East from the Northstarre, then the Northstarre, is the third part of a point vnto the Westward of the North Pole, &c.

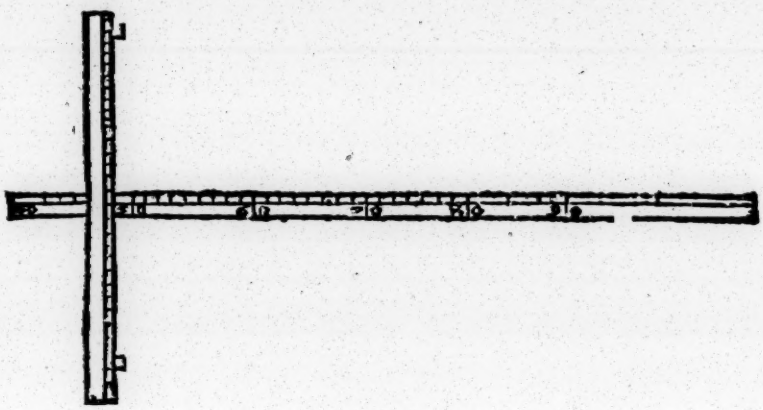
This haue I said, because that sometime in sundry places, the compasse doth varie (the variation is called the Northeasting or Northwesting of the compasse) and especially in the sayling of long voyages, running East and West, therefore I would not wish them to meddle with the mending of their compasse, or whetting of the side of the needle, to the ende to make it stand due North, but circumspectly to awaite the altering of the compasse, and what quantity it doth alter: as you may do verie well by the order before rehearsed, and then let your compasse alone: for although that it doth varie two or three points, you may make account according to the variation, as thus; I admit the Northwest point standeth due North, and my course is to goe due West, I will occupie the Southwest point in this case for the West point. And thus (by obseruation and trying of my compasse) I care not what point standeth due North, for it is all one, so that you consider what point standeth North. And also there is deuised by one Normam a compasse maker, a verie necessarie deuice in a compasse, that you may set the North point vpon what degree you list, according vnto the true variation of the compasse, at all times at your pleasure.

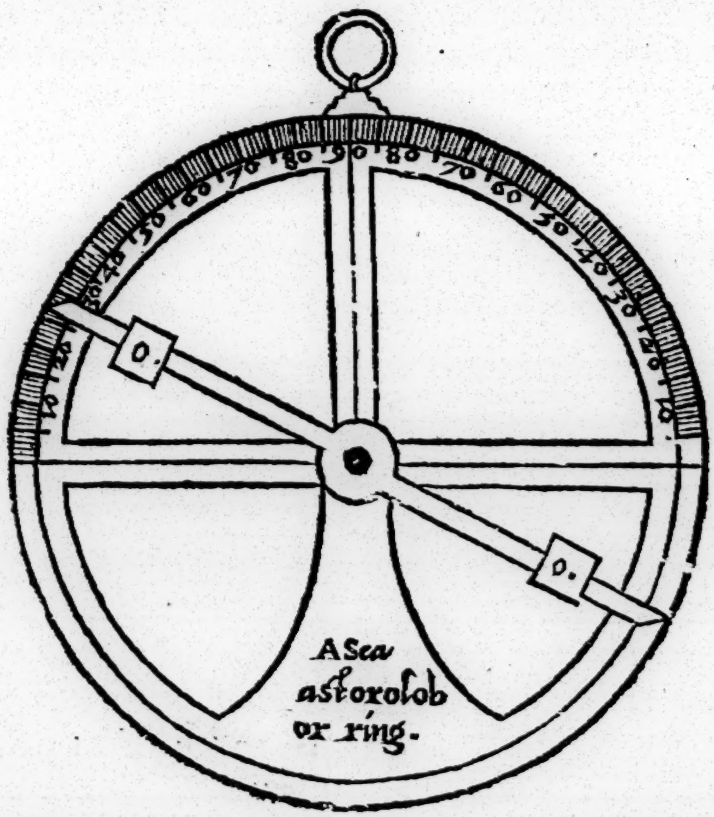
Meddle not with your compasse although it be varied.

To saile by the compasse that is varied.

The Bella Stella, or Crosse staffe:

to take the height of the Sunne or Starre.





The vij. Chapter ſheweth how to handle the declination of the Sunne, to know the altitude of the North Pole aboue the Horiſon, (the height of the Sunne being truly taken & knowen, in any place betweene the North Pole and Equinoctiall) ſo that the Sunne be vnto the the Southwards of you at the taking of the Sunne vpon the Meridian.

YOV muſt conſider by the Regiment or table of declination (going before) that the 10. day of March in the yeare 1600. the Sunne is in the Equinoctiall, entering then the firſt point of Aries, (called the Equinoctiall, of the ſpring time) where he hath no declination. The 10. day of Aprill, the Sunne entereth into the firſt minute of Taurus, then hauing declination to the Northwardes 11. derees 30. minutes. The 11. day of May, the Sunne entereth the firſt point of Gemini, hauing then declination 20. degrees 12. minutes. The 11. day of June the Sunne entereth into Cancer, where he (making his greateſt progreſſe to the Northwards) hath 23. degrees 28. minutes of declination. But nowe in this our time, ſome do affirme it to be 23. degrees and a halfe, but it lacketh two minutes.

The greateſt declination of of the Sunne.

The 13. day of July the Sunne entereth into Leo, comming downewards to the Equinoctiall, hauing 20. degrees 12. minutes of declinatiõ. The 13. day of Auguſt, the Sunne entereth into Virgo, hauing declination 11. degrees 30. minutes. The 11 of September, the Sunne entreth into Libra, (then being in the Equinoctiall, and hauing no declination) which is called the Equinoctial of Autumne or harueſt, where he beginneth his South declination. The 13. of October the Sunne entereth into Scorpio, where his declination is 11. degrees 30. minutes. The 12. of Nouember the Sunne entereth into Sagittarius, his declination being 20. degrees 12. mi-

Equinoctiall of Autumne.

12. minutes. The 12. day of December the Sunne entereth the first minute of Capricorne, where the Sunne (making the greatest progresse to the Southwards) hath of declination 23. degrees and 28. minutes. From whence he returneth to the Equinoctiall againe. The 11. of Januarie the Sunne entereth into Aquarius, where his declination is 20. degrees 12. minutes. The ninth day of Februarie the Sunne entereth into the first minute of Pisces, and hath declination 11. degrees 30. minutes. The 11. day of March, the Sunne returneth to the selfe same place that it departed from before: wherefore the Egiptians did paint the yeere like to an Adder biting her taile, not hauing the vse of letters. And the Romanes called a Ring, Annulus, as it were Annus, that is to say, a yeere, because a Ring doth turne round in it selfe, as doth the yeere. The Meridian height of the Sunne being knowen, you knowing the day of the moneth, and what yeere it is after the Bissextilis, must turne to the day of the moneth, in the Regiment or Table going before, where right against the day of the moneth you shall finde the degrees of declination, and the odde minutes belonging to the degrees of declination following: that being knowen (that is to say, the Meridian height of the Sunne with the degrees & minutes of the declinatiõ) consider with your selfe whether the Sunne declineth from the Equinoctiall toward that Pole, which is aboue the Horizon, or toward that Pole, which is vnder the Horizon. If the Sunne declineth from the Equinoctiall toward that Pole, which is aboue the Horizon, you must alwaies subduct the declination from the Meridian Altitude of the Sunne, the remainder is the height of the Equinoctiall. The height of the Equinoctiall being subducted from 90. yeeldeth the height of the Pole aboue the Horizon. But if that the Sunne declineth toward that Pole which is vnder the Horizon, you shall adde or put that declination vnto the height of the Sunne, the totall summe shall shew vnto you the true height of the Equinoctiall, the which summe being taken from 90. that which doth remaine, shall be the Alti-

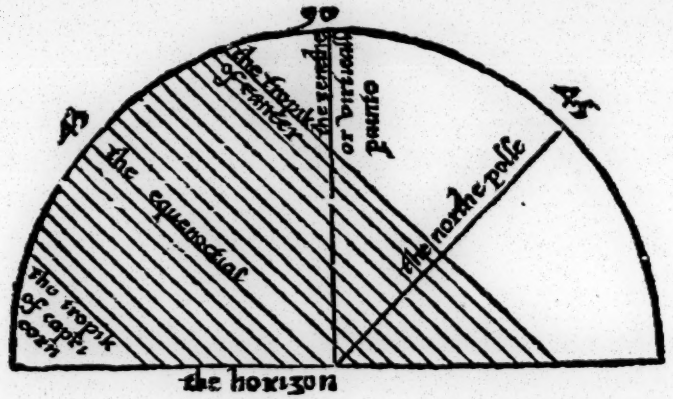
The greatest declination to the South.

The yeere is compared vnto a Ring or Adder biting her taile.

The height of the Sunne being taken and knowen, then how to handle the declination, to knowe the height of the Poles.

Things to be noted as touching the taking of the Altitude of the Pole.

tude of the Pole aboue the Horizon. For this is to be noted: that what height the Equinoctiall is aboue the Horizon, such is the distance betweene the Zenith or verticall point, and the Pole. In like manner, looke how many degrees and minutes are betweene the Equinoctiall and your Zenith, so many degrees and minutes are from the Pole downe to the Horizon, & this is the cause why you must take the height of the Equinoctial, out of 90. degrees. For your Zenith being alwaies 90. degrees frō the Horizō (as you see by this figure following) the height of the Equinoctial being taken out of that nūber, leaueth ỹ distance betwene the Zenith, & ỹ Equinoctial, which is equall to the height of the Pole aboue the Horizon.



The viij. Chapter sheweth you how to handle the declination of the Sunne: when you are betweene the Equinoctiall and the Sunne: that is to say, the Sunne being to the Southwards or Northwards of you, betweene the Sunne and the Equinoctiall, or vnder the Equinoctiall: the height of the Sunne being truely knowen or taken.

NOW furthermore if you be vnto the South parts neere vnto the Equinoctiall, so that the Sunne haue any great declination eyther to the Southwards, or to the Northwards, you being

being betweene the Equinoctiall and the Sunne, when you haue taken the true height of the Sunne, with the Astrolabie to know the height of any of the two Poles, doe this: seeke the declination of the Sunne for that day, with the degrees and minutes, the declination being knowen and the height of the Sunne in like manner, then adde the declination of the Sunne vnto the height thereof, and it will exceed or be more than 90. degrees, then againe looke how many degrees it is more than 90. that shall be the true height of the Pole towards that side that the Sunne is: because the Equinoctiall is the number of degrees aboue 90. (which is your Zenith) to the contrarie part from the Sunne-ward. For (as I haue said in the Chapter going before, and it is generall for euer) what height soeuer the Equinoctiall is from the Horizon, that is the true distance betweene the Zenith, & the Pole: In like manner, looke what distance is betweene the Equinoctiall and the Zenith, the same is the true distance betweene the Horizon and the Pole, that is to say, the Pole is so many degrees in Altitude aboue the Horizon. And whereas it is a common saying (in searching howe farre wee bee vnto the Southwards or Northwards) that the Pole Arcticke is so many degrees in Altitude, or (as some will say,) that we are so many degrees in Latitude: that saying is all one in respect, although the one be called Altitude or height, and the other Latitude or wideneſſe: for as when you say Altitude or height of the Pole, you meane the Pole is raised so many degrees aboue the Horizon. So likewise when you say Latitude, you meane, you be so many degrees in wideneſſe from the Equinoctiall, for that your Zenith or verticall point is so many degrees from the Equinoctiall, as the Altitude is founde to bee. Moreouer, if you chaunce to bee right vnder the Equinoctiall, as you cannot say that you haue any Latitude, so likewise cannot you say that you haue any Altitude, for that the two Poles bee then iuſt with your Horizon, and in like manner the Equinoctiall passeth by your Zenith or verticall point. But when you will take

Altitude or Latitude is all one queſtion in effect.

Being vnder the Equinoctiall, you haue neither Latitude nor Altitude, for that the Equinoctiall is your Zenith, and the Poles your Horizon.

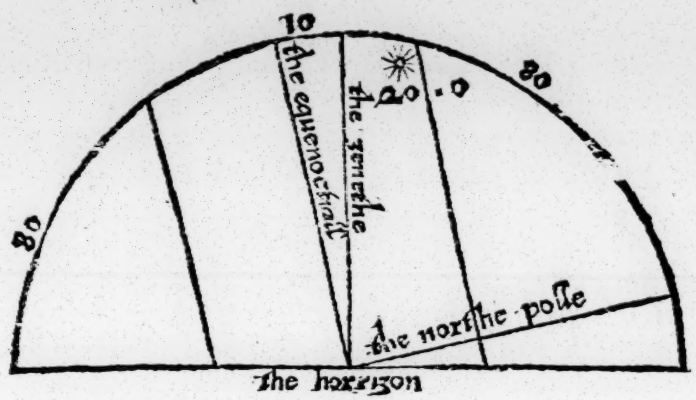
the height of the Sunne with your Astrolabie, then looke what declination of the Sunne hath, eyther to the Southwards or Northwards. Then put the declination of the Sunne vnto the height of the same, and the number will be iust 90. degrees: if it lacketh any thing of 90. degrees, then it signifieth that the Equinoctiall lacketh so much of the Zenith, and so much iust shall the Pole be aboue the Horizon, towards that part that you be in from the Sunn-wards. But contrariwise if it doth exceed, or be any thing more than 90. degrees, then (as afore is declared) it signifieth that the Equinoctiall is as much as that number (both in degrees and minutes,) On the contrarie side from the Sunn-wards, that is to say, your Zenith shall be betweene the Sunne and the Equinoctiall, and the Pole shall be so many degrees or minutes aboue the Horizon, as is the distance betweene the Zenith and the Equinoctiall, towards that part or side that the Sunne is on. Wherefore I do thinke it necessarie to giue certaine ensamples (and first take this for an ensample.) Admit I doe take the height of the Sunne vnto the Northwards 80. degrees aboue the Horizon, and the Sunne hath declination vnto the Northwards 20. degrees, to which I adde or put the height, that is to say 80. degrees, being the height of the Sunne, and 20. degrees, being the declination of the Sunne, doe make 100. from which I pull 90. away, which is my Zenith, and so there remayneth 10. degrees. Wherefore you may conclude, that the Equinoctiall is 10. degrees to the South part of the Zenith, and the Sunne to be 10. degrees to the North part of your Zenith, so that the North Pole is 10. degrees aboue the Horizon, as by ensample it is declared.

Of your Zenith being betweene Equinoctiall and the Sunne.

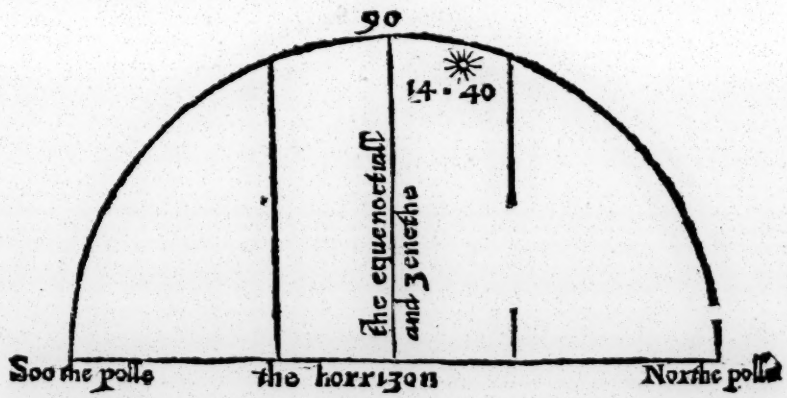
An ensample.

An ensample where the Pole is 10. degrees aboue the Horizon.

And

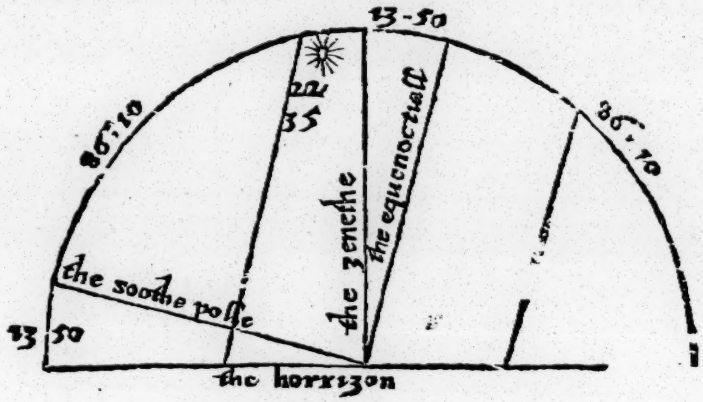


And for the second ensample, admit I take the sunne vnto the Northwards. 75. degrees, and 20. minuts aboue the Horizon, the sunne hauing North declination. 14. degrees, fortie minutes, I then do adde or put 14. degrees, fortie minutes, vnto 75. degrees 20. minutes, and those two ioined together maketh 90. degrees, whereof you may conclude, that the Equinoctiall is your Zenith, and then the two Poles be with your Horizon, as by this example it doth appeare.



And now followeth to the third ensample. I admit the Sunne be taken with the Astrolabie 81. degrees and 15. minutes aboue the Horizon, and the sunne hath South declination 22. degrees 35. minutes, wherfore I doe adde or put together 81. degrees and 15. minutes, being the height of the sunne, and 22. degrees 35. minutes being the declinatiō, and that maketh 103. degrees, 50. minutes: from which I take An ensample.

away 90. degrees, which is my Zenith, so that there remaineth 13. degrees 50. minutes: so that you may safely conclude, that the Equinoctiall is 13. degrees 50. minutes, vnto the North parts of the Zenith, and then it must needs follow, that the south Pole is 13. degrees 50. minuts aboue the Horizon, as by this ensample it is declared.



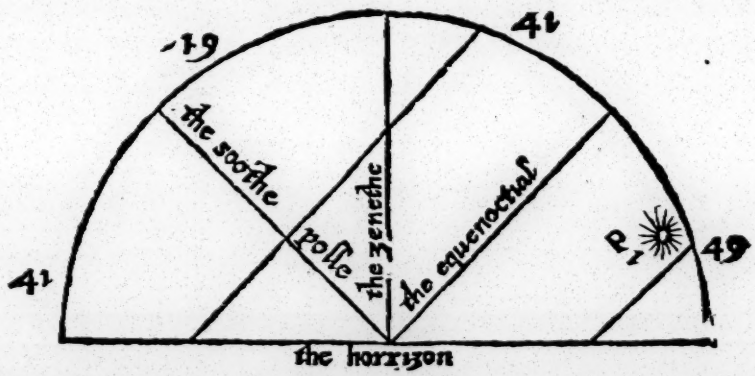
¶ The ninth Chapter sheweth how to handle the declination of the Sunne, when you are beyond the Equinoctiall, that is to say, betweene the South Pole and the Equinoctiall: with certaine ensamples both for the South Pole and the North Pole.

AND furthermore, if you bee vnto the southwardes beyonde the Equinoctiall, as betweene the Tropicke of Capricorne and the South Pole, then to vse the declination of the Sunne to know the height of of the South Pole or Antarticke Pole, by the height of the Sunne, there is no other matter in the doing thereof, but wheras wee (being vnto the North partes) doe adde the South declination vnto the height of the sunne, and rebate the North declination from the height of the Sunne, so in like manner the contrarie is to be vsed, that is to say, to rebate the South declination from the height of the

To take the Sunne to the Northward, you being betweene the South pole & the Equinoctiall.

the Sunne and to adde vnto the height of the Sunne the Nozth declination. As foz enſample, I admit the height of the Sunne be taken 28. degrees aboue the Hozizon due Nozth, and the declination of the Sunne is 21. degrees vnto the Nozthwardes, I doe then adde the declination of the Sunne which is 21. degrees, vnto the height of the Sunne (being 28. degrees,) which maketh 49. degrees, and ſo many degrees the Equinoctiall is aboue the Hozizon vnto the Nozthwardes, and then (as it is befoze declared) pull that ſumme out from 90. Degrees, and there remaineth 41. degrees, which is the diſtaunce betweene the Zenith and the Equinoctiall, which alwaies is equall with the diſtance betweene the Pole and the Hozizon: ſo that you may conclude the South Pole to be raiſed 41. degrees aboue the Hozizon. As by the figure it is ſhewed.

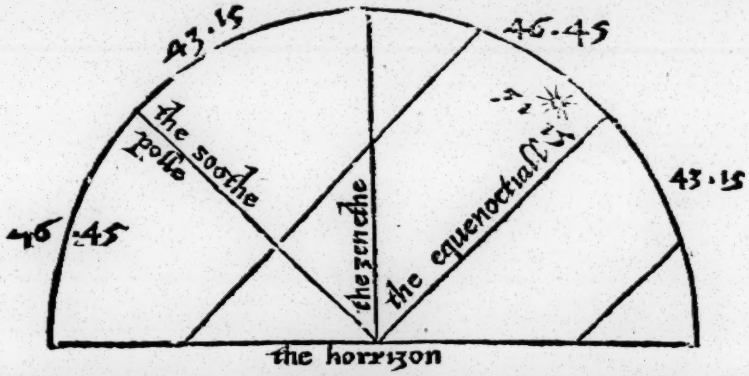
An enſample by taking the ſouth pole 41. degrees aboue the Horizon.



And furthermoze if the Sunne haue ſouth declination, then (as befoze is declared) you muſt ſubſtract oz take away the Sunnes declination from the height of the Sunne, as foz enſample. The height of the ſunne being taken at 50. degrees 30. minutes into the Nozth parts, and the ſunne hauing 7. degrees & 15. minutes of declination vnto the ſouthwards, from which height of the ſunne (foz that you are vnto the Southwards beyond the Equinoctiall) you muſt rebate the declination, which is 7. degrees and 15. minutes, & there reſteth 43. degrees 15. minutes, foz the true height of the

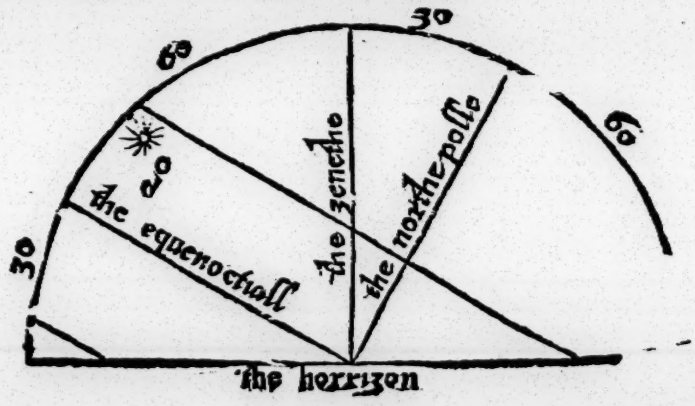
Equinoctiall

Equinoctial, which ſumme you muſt take out of 90. degrees, that done, remaineth 46. degrees 45. minuts, the true height of the ſouth Pole aboue the Horizon, otherwiſe called the Antarticke Pole, as by enſãple of this figure is plainly ſhewed.



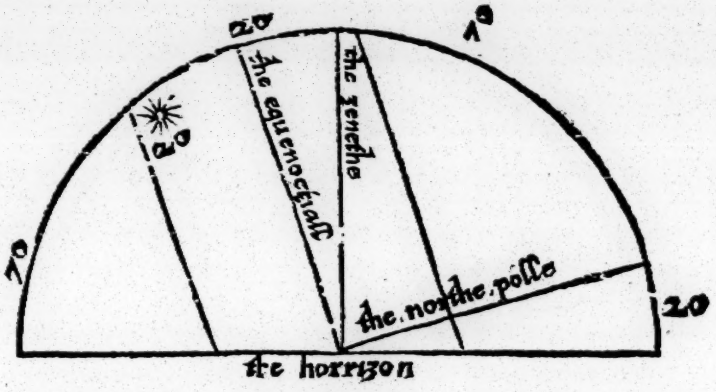
An enſample by taking the north pole 60. degrees aboue the Horizon.

Yet furthermoze I do thinke it conuenient to giue you an enſãple vnto the Nozthwards, that you may perfectly know the true ozder of the wozking, both foz the Nozth part, & alſo the South part. Admit therefoze I take the height of the ſunne due South, at 50. degrees aboue the Hoziz̃, the ſunne hauing then Nozth declination 20. degrees: Now (foz as much as you haue the Nozth Pole aboue the Hoziz̃on) you muſt rebate the ſuns declination from the height: ſo that 20. degrees being taken away from 50. there reſteth 30. which is the height of the Equinoctial aboue the Hoziſon, & that 30 being taken frõ 90. there reſteth 60. So that you may boldly affirme the Nozth Pole to be 60. degrees aboue the hoziz̃on, as by this figure following it is ſhewed.



In

In like manner the ſunne being taken at that height and due South, hauing the like declinatiõ alſo to the ſouthwards that it had before to the Northwards: that is to ſay, being 50. degrees in height, & hauing 20. degrees of declinatiõ vnto the ſouth parts, you muſt adde or put the declinatiõ of the ſunne vnto the height of the ſame, and it maketh 70. degrees, which is the height of the Equinoctiall aboue the horizon: this done, that 70. being takẽ out of 90. there remaineth but 20. ſo that the North Pole is but 20. degrees aboue the horizon, as by the enſample of this figure is ſhewed.



For by the declination and the height of the ſunne, the true height of any of the Poles is knowne. Alwaies hauing this conſideration, that if the North Pole bee aboue the Horizon, the ſouth declination muſt be added, or put to the height of the Sunne, but the North declination of the Sunne muſt be ſubducted from his height, contrariwiſe, if the ſouth Pole be aboue the Horizon, you muſt adde the North declination vnto the height of the ſunne, and take away the ſouth declinatiõ from the height of the ſame. Now to know which of the two Poles be aboue the Horizon, is a very eaſie matter, and is knowne two waies. For firſt if the North Pole be aboue the Horizon, you may know it by al the ſtarres round about the Pole as Charles waine, and the Guards, with ſuch other markes as be about the North Pole. Neither cã you paſſe ſo ſodainly beyond the Equinoctial, but it muſt needs be knowẽ vnto

A thing to bee noted in the handling of the ſunnes declination.

How to know which of the 2. Poles be vnder the Horizon.

vnto you & then you muſt vſe that kind of working with the ſuns declination, that in the chapter or rule before is rehearſed: and alſo you may know it by the Arke or bearing of the ſtarres & lights round about you: for if you turne your face toward the Equator, you ſhall ſee the ſtarres aſcend frō your left hād toward your right, if you be on the North ſide of the worlde: But if you be on the South ſide, and turne your face towards the Equinoctiall, you ſhall ſee them riſe from the right toward the left hand. Thus much haue I ſaid as touching the ſunnes declination, becauſe I know that diuers Engliſh mē would haue trauailed further beyond the Equinoctiall than they haue done, but that they haue not had the capacitie to handle the ſunnes declination when they haue beene beyond the Equinoctiall, that is to ſay, vnto the ſouth parts, hauing loſt the markes aboue the North Pole, as the North ſtarre and other, and as for the ſtarres of the South, they haue not beene acquainted with them, but haue beaten vp and downe alongſt the coaſt of Ginny and Binney, & there haue ſpoiled and conſumed their men, through the extraordinarie heate of the ſunne, not knowing that in going further to the ſouth parts, they ſhould haue brought themſelues into a good temperate Climate againe.

The cauſe why Engliſh men haue not trauailed far beyond the Equinoctiall.

An vntēperate place for extreme heate.

Temperate Clymate.

¶ The tenth Chapter ſheweth, how to hādle the ſunnes declinatiō vnto the Northwards, where the ſunne doth not ſet vnder the Horizon, and alſo to take the Sunne at the loweſt being due North.

FOr further vſe of the Sunnes declination, if you haue any occaſiō to trauel vnto the Northwards or ſouthwards more thā 67. degrees of altitude of any of the two Poles, or if the ſun haue any great declinatiō vnto thoſe parts that you are in, then ſhal not ẏ ſun go down vnder the Horizon in a long time after, according as you are in diſtance more or leſſe vnto the North parts, for if you were right vnder either of the 2. Poles of the world, then would

Of beeing vnder eyther of the Poles.

would not the Sunne goe vnder the Horizon in halfe a yeare, so that there should be continually day so long. And now for the handling of the Sunnes declination, to know the height of the Pole, and to take the Sunne North at the lowest, doe this: First with your crosse staffe, obserue the Sunne at the lowest, taking the true distance betweene the Horizon and the Sunne, that being truly done, looke what declination the Sunne hath: then haue you to consider that except the Sunne be neere vnto his greatest declination, that is to say, in the latter end of Gemini, (or the beginning of Cancer,) the Sunne doth decline little in 24. houres: but if the declination bee verie swift, you must seeke the Sunnes declination vpon the day before, and the day after, halfe the diuersity of which shall be the Sunnes declination: for that the Sunne is at the angle of midnight. The Sunnes true declination being knowen, rebate his height from the declination, and so shall you haue the true content in degrees and minutes, that the Equinoctiall is vnder the Horizon due North, and then pulling that summe from 90. that which remaineth, shall be the height of the Pole aboue the Horizon: for as it is before declared, looke what height the Equinoctiall is aboue the Horizon, that is equal to the distance betweene the Pole and the Zenith, and looke what distance is betweene the Equinoctiall and the Zenith, the same distance is betwene the Pole & the Horizon, in like manner, looke how deepe vnder the Horizon the Equinoctiall is vnto the Northwards, so high is the Equinoctial vnto the Southwards. As for ensample, admit I were vnto the Northwards of the North cape, the Sunne being in his greatest declination vnto the Northwards, which is about the 11. day of June 23. degrees & neare a halfe: this being knowen, I take the sunne due North at the lowest, iust sixe degrees aboue the Horizon, the declination being 23. degrees and 28. minutes. Wherefore I rebate from that, sixe degrees, and so there remaineth 17. degeees & 28. minutes, which expresseth the depth of the Equinoctiall vnder the Horison, & then do I pul that summe frō 90. & there remaineth 72. degrees 32. minutes,

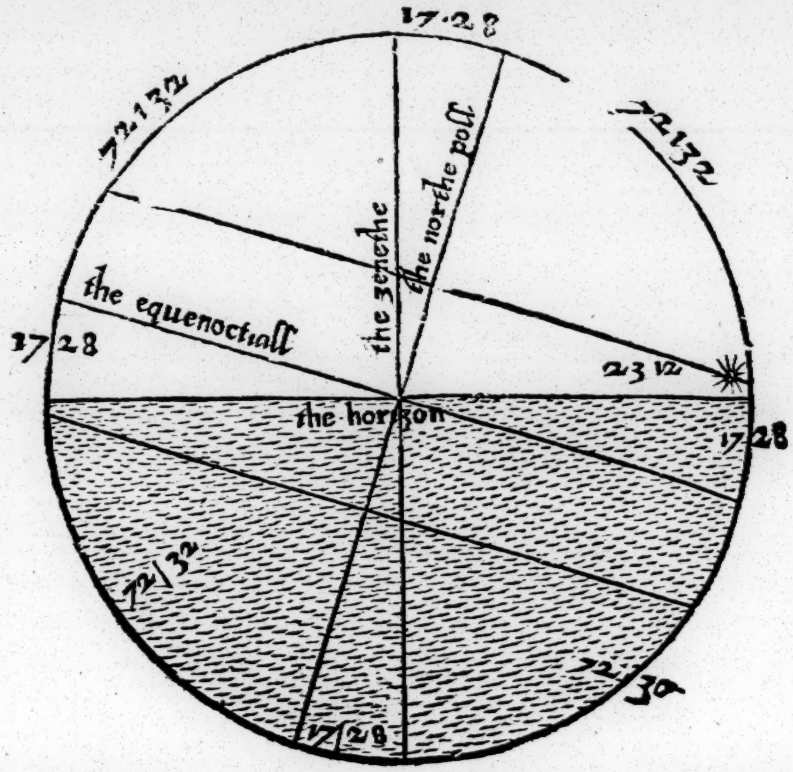
Of taking the height of the Sunne due North at the lowest.

A thing worthy to be noted, touching the Snnnes declination.

A thing to be noted of the Pole and the Equinoctiall the Zenith, & the Horizon.

The Sunne taken due North at 6. dgrees.

minutes, for the true height of the North Pole aboue the Horizon, as by this ensample folowing is declared.



By this ensample you may also know the true height of any of the two Poles, & how to obserue the sunne at the lowest, when the sunne commeth neerest vnto the Horizon, as well as you may when the Sunne is in the Meridian at the greatest height from the Horizon, which is very necessarie for them that doe occupie vnto the Northwardes, as vnto Saint Nicholas in Russia, it is also very necessarie for them that would attempt any voyages of discouery to finde out the passage to come vnto Cataie and China, and the Ilands of Moluccas, vnto the Northwardes, as into the East, by Noua Zemla, or to the West, by that way that Captaine Frobisher, hath begun to the north wards of Baccalaios & Labrador, for it is to bee supposed, that amongst that broken lands

Of voiages for discouery to the Northwards either to the Estward, by Noua Zemla or to

lands and Ilands, that there may be found passage vpon the north part of America, but the great quantitie of Ise may somewhat hinder the prosperitie of that discouerie, and yet notwithstanding my opinion is, that it is not frosen there so much to haue such huge quantitie of Ise, but that it may be frosen more farther vnto the North parts, and so by some current or streame brought thither, and so is stayed vpon the coast of Labrador and Baccalaios, by the meanes of the great current that cõmeth out of the Bay of Mexico, all alongst the North side from Florida vnto Baculaios, or new found land. the Westward by Cape de Paramantia. Additions.

And yet notwithstanding, it may be possible that if that they did discouer more vnto the northwards, that they should not meete with so much Ise. For at the North cape in Norway, which is much more vnto the Northwards, there is seldome seene any great quantity of Ise, and yet some ships haue beene beaten of vnto the North of the cape neere 200. leagues, so that they had then neere 80. degrees of height of the North Pole aboue the Horizon, and yet they haue not met with Ise, and it is farther vnto the North parts by 17. degrees, then that place that Frobisher was at.

Wherefore if it were attempted, there is no doubt but they should finde it Nauigable either to the East part, or to the West part: And I am of this opinion, that the thing most feared in making their discouerie, vnto the Northward, deserueth not so greatly to be feared as they doe make it, the cause why they are so loth to goe very farre vnto the Northwards, is, for that it is the frosen Zone, but my opinion is, that in Summer time it is not to be feared, but the further vnto the Northwards, the more temperate warme, by means of the long continuance of the Sunne: for as we see by common experience, a thing once being made warme, cannot sodainely be made cold, neither is their doubt of any great cold vntill the Sunne be vnto the Southwards of the Equinoctiall: for I admit that a ship should saile vnto the Northward, and not stay vntill the North Pole were eleuated 80. degrees aboue the Horizon, I doe thinke then they should find it very Of temperatenesse the Pole being raised 80. degrees.

temperate and warme, vnto the middle of September, for that by the space of nine weekes together, that is to say, from the 10. of May, vnto the 12. of July, the Sunne should come no nearer vnto the Horizon due North then 10. degrees, and 30. degrees vnto the South part aboue the Horizon, and yet it is possible that it may be colde there vntil the ende of May, for that the Sunne must haue a time to make the aire warme. For like as a thing once being colde, cannot be sodainly made warme, so in like manner a place being once made warme, cannot be sodainly made cold.

And furthermore, he that were in the Latitude of 80. degrees, should haue but a short Paralell: for the whole compasse of the earth and the sea going East and West, to come round about to that place againe in the same Paralell, is but 1250. English leagues, euerie league containing three English miles: So that in sailing of lesse then 500. or 600. leagues, they might see whether it were nauigable or not. For this is one principle, that if that they doe not meete with land, then they shall finde sea, to accomplish the long desired passage to finde out Cattaie.

The length of the paralell. 80 degrees, is but 1250. English leagues.

The xj. Chapter doth shew how you shall know the length of the day, and to know how much the day is shortned or lengthned by the Sunnes declination.

NOW I think it conuenient for sea-faring men to know the length of the day in any place that they haue occasion to goe vnto: for that they haue occasion to trauell into all the climates and places, transporting themselues many times quickly from one place to another: and although the auncient writers haue appoynted certaine climates, and other late writers in like manner haue made tables verie exact for the longest or shortest day in a-

nie

nie of those climates and other places, according to the elevation of the Pole: yet haue they not opened anie way vnto them, in giuing any order, for them to knowe when the day is an houre longer or shorter, whereby they might at all times know the length of the day, which notwithstanding is verie necessarie for them, for that they be abroad vnder saile both night and day, and in like manner for that they must keepe account of houres and times exactly, in as much as they ought to keepe an account of the shippes way: wherefore it must needes be most necessarie for Nauigation, to knowe the true time of the Sunnes rising and setting, which you shall knowe by this meanes: First it is not vnknowen, that vnder the Equinoctiall the Sunne is 12. houres aboue the Horizon, and 12. houres vnder the Horizon, (what declination soeuer the Sunne hath) so that there the Sunne riseth at six of the clock, & setteth at six of the clocke forever.

How necessary it is for a Seafaring man to know the length of the day.

Vnder the Equinoctiall, the day is alwaies 12. houres long

And where the Pole is rayled 16. degrees and 44. minutes, there the longest day is 13. houres, (the Sunne hauing his greatest declination at 23. degrees, 28. minutes) and the shortest day is 11. houres long, and then looke when the Sunne hath declined 23. degrees and a halfe either backwardes or forwardes, for then the daye is an houre longer or shorter and proportionably: when the Sunne hath declined 11. degrees 44. minutes, then it is halfe an houre longer or shorter, &c. Moreouer where the Pole is eleuated 30. degrees 48. minutes, there the longest day is 14. houres, and the shortest day is 10. houres long, the Sunne then rising at fiue of the clocke, and setting at seuen of the clocke, and there when the Sunne hath declined 11. degrees and 44. minutes from the Equinoctiall, vnto the greatest declination, then the day is an houre longer or shorter, and when the Sunne hath declined fiue degrees 52. minutes, then the day is halfe an houre longer or shorter, &c. Furthermore also where the Pole is rayled fortie one degrees 23. minutes, there the longest day is 15. houres, and the shortest, nine houres long, (the Sunne hauing his

The Pole 16. degrees 44. minutes, the day 13. houres long, when it is at the longest.

The Pole 30. degrees 48. minutes, the longest day 14. houres long.

The Pole 41. degrees 23. minutes, the longest day 15. houres long.

his greatest declination, and as then rising at foure of the clocke 30. minutes, and setting at seauen of the clocke 30. minutes,) so that there when the Sunne hath declined seuen degrees 49. minutes from the Equinoctial, the day shall be an houre longer or shorter, and when it hath declined three degrees 54. minutes, the day shall be halfe an houre longer or shorter, &c. And furthermore, where the Pole is raised 49. degrees one minute, there the longest day is 16. houres, and the shortest eight houres long, the Sunne rising at foure of the clocke, and setting at eight of the clocke, so that there, when the Sunne hath declined fiue degrees 52. minutes from the Equinoctiall, then shall the day be an houre longer or shorter. And when the Sunne hath declined two degrees 56. minutes, then the day shall be halfe an houre longer or shorter, &c. Yet furthermore, where the Pole is raised 54. degrees 30. minutes, there the longest day is 17. houres, and the shortest seauen houres long, the Sunne then rising at three of the clocke 30. minutes, and setting at 38. minutes: then when the Sunne hath declined foure degrees and 41. minutes from the Equinoctiall, to the greatest declination, the day is an houre longer or shorter, and when he hath declined two degrees 21. minutes, the day is halfe an houre longer or shorter, &c. Where also the Pole is raised 58. degrees 27. minutes, there the longest day is 18. houres long, and the shortest but fiue, and then when the Sunne hath declined three degrees 55. minutes from the Equinoctiall, the day shall be an houre longer or shorter: and when the Sunne hath declined two degrees lacking two minutes, then the day shall be halfe an houre longer or shorter. Furthermore also, where the Pole is raised 61. degrees 18. minutes, there the longest day is 19. houres long, and the shortest but fiue houres: then shall the Sunne rise at two of the clocke 30. minutes, and set at 39. minutes, and then when the Sunne hath declined three degrees, and 21. minutes from the Equinoctiall, then shall the day be an houre longer or shorter, &c. Furthermore, where the Pole is raised 63. degrees 22. minutes

The Pole raised 49. ddgrees one minute, then the longest day is 16. houres long.

The Pole rayſed 54. degrees 30. minutes, then the longest day is 17. houres long.

The Pole rayſed 58. degrees 27. minutes, the longest day is 18. houres long.

The Pole rayſed 61. degrees 18. minutes, longest day is 19. houres long.

nutes there the longest day is 20. houres long, and the shortest but foure houres, then shal the sunne rise at two of the clock, and set at 10. of the clocke, and when the Sunne hath declined two degres, and 56. minutes from the Equinoctiall vnto the greatest declination, then shall the day be an houre longer or shorter, &c.

The Pole 63. degrees one minute, the longest day 20 houres long.

Now where the Pole is raised 64. degrees 49. minutes, there the longest day shall be 21. houres long, and the shortest but three houres: and then when the Sunne hath declined but two degrees 36. minutes from the Equinoctiall vnto the greatest declination, the day shall be an houre longer or shorter. Where also the Pole is raised 65. degrees, there the longest day shall be 22. houres, and the shortest but two houres long, and when that the Sunne hath declined but two degrees and 20. minutes from the Equinoctiall, then the day shall be an houre longer or shorter. And where the Pole is rayled 66. degrees 20. minutes, the longest day shall be 23. houres long, and the shortest but one houre long, and then when that the Sunne hath declined but two degrees eight minutes, the day shall bee an houre longer or shorter, and where that the North Pole is raised 66. degrees and 32. minutes, there it is 24. houres long, for that when the Sunne hath his greatest declination vnto the Northwards, then at midnight, you shall see halfe the Sunne, and when that the Sunne hath the greatest declination vnto the South parts, then you shall see but halfe the Sunne at noone, and in going but 15. miles further vnto the Northwards, that is, but one quarter of a degree, then the Sunne shall be cleane aboue the Horizon at the due North, and not seene at noone aboue the Horizon, the Sunne hauing his greatest declination to the South, and then the day shall bee an houre longer or shorter, when that the Sunne hath declined one degree 57. minutes from the Equinoctiall, and so forth vnto the greatest declination. And thus much haue I said as touching the length of the day, wherby you may know at all times the true length of the day in any Latitude betweene the Equinoctial and the

The Pole raised 64. degrees 49. minutes the longest day 21 houres long.

The Pole 65. degrees the longest day 22 houres long.

The Pole 66. degrees 20. minutes the longest day 23 houres long.

The Pole 66. degrees 32. minutes, then the Sunne shal not set vnto them.

The sun cleane aboue the Horizō due north, and not to appeare aboue the Horizon, south at noone

To know the length of the day at any time, in any place: what the day is.

eleuation of the Pole at 66. degrees & 32. minutes, by knowing how many degrees the Sunne is declined. And that you may know on euery day by the regiment going before, hauing this consideration, if the Sunne be in the Equinoctiall, hauing no declination, then in any latitude the day is alwaies iust 12. houres long. And you must note this, that it is called the day from the rising of the Sunne, vnto the setting of the same vnder the Horizon, & not from day light vnto day light. For before the Sunne rise, and after that the Sunne is set, it is counted for no parcell of the day, but it is called the day light. And furthermore, the day light will appeare by that time that the Sunne doth touch the 17. degree vnder the Horizon before the Sunne rising, and also the day light will not be cleane gone vntill the Sunne be more than 17. degrees vnder the Horizon: as you may perceiue heere with vs at London, that when the Sunne hath his greatest declination vnto the Northwards in June, the day light remayneth all night, for that the Sunne goeth not vnder the Horizon, but 15. degrees.

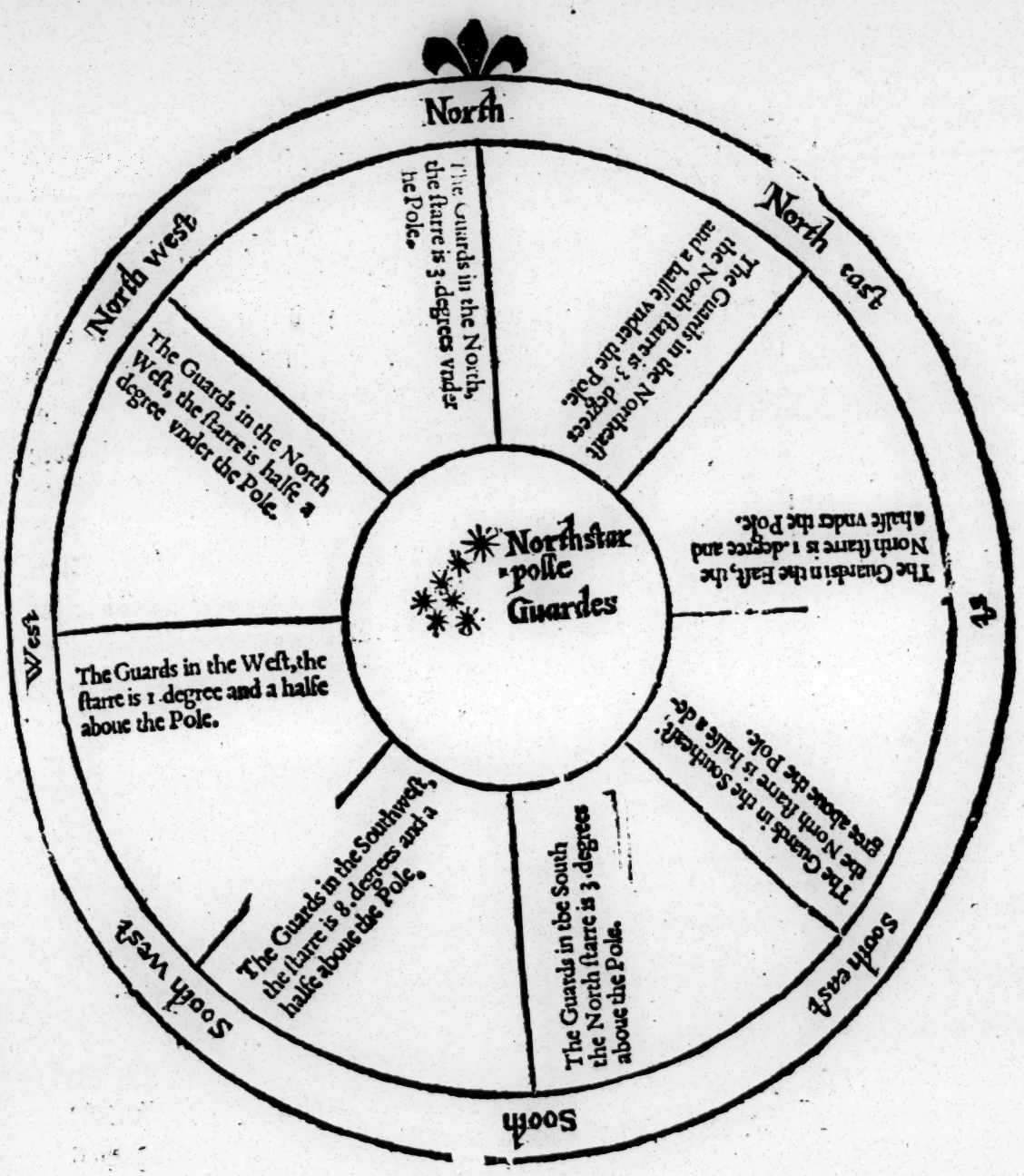
The xii. Chapter is of the North starre.

AS touching the North starre, I say but little therof, for that is sufficiently declared in the Art of Nauigation, the starre hath Longitude vnto the 21. degree, 35. minutes of the signe of Gemini, and commeth to the Meridian with three degrees 45. minutes of Aries. This starre standeth vpon the tippe of the taile of Vrsa minor, or the little Beare, and hath Latitude from the line Ecliptick 66. degrees, and declination from the Equinoctiall 86. degrees 30. minutes, so that it is distant from the Pole three degrees and 30. minutes. Here note that some of late time making obseruation, affirme that the Pole starre is but two degrees 54 minutes from the Pole.

The North stars declination.

Heere followeth the note by the Guards, to know whether the North starre be aboue the Pole or vnder the Pole, and how many degrees and minutes, &c.

By


North
North east
East
South east
South
South west
West
North west
Northstar
pole
Guardes
The Guards in the North, the ſtarre is 3. degrees vnder the Pole.
The Guards in the North Weſt, the ſtarre is halfe a degree vnder the Pole.
The Guards in the North east, the North ſtarre is 3. degrees and a halfe vnder the Pole.
The Guards in the Eaſt, the North ſtarre is 1. degree and a halfe vnder the Pole.
The Guards in the Weſt, the ſtarre is 1. degree and a halfe aboue the Pole.
The Guards in the Southweſt, the ſtarre is 8. degrees and a halfe aboue the Pole.
The Guards in the South the North ſtarre is 3. degrees aboue the Pole.
The Guards in the Southeaſt, the North ſtarre is halfe a degree aboue the Pole.

By obſeruing of that, which is ſet downe in the former figure we may readily finde the height of the Pole, the height of the North ſtarre being alſo knowen. For if in taking the height of the North ſtarre, we finde the guardes to beare from it Weſt South-weſt, South or South-eaſt, then from the height of the ſtarre we muſt ſubduct ſo much as by this figure we finde the ſtarre to be aboue the Pole, the remainder expreſſeth the height of the Pole. But if in taking the height of the North ſtarre we finde the guardes to beare from it Eaſt, Northeaſt, North or Northweſt, then vnto the height of the ſtarre, we muſt adde ſo much, as by the former figure we finde the ſtarre to be beneath the Pole, the totall ſumme expreſſeth the height of the Pole. Furthermore by two ſeuerall Altitudes of the North ſtarre or any other ſtarre which doth neuer ariſe or ſet, the height of the Pole may be found in this manner, take the height of the ſaid ſtar when it is at the higheſt in the Meridian, take alſo the height of the ſame ſtar when it is at the loweſt, adde both the heights together, the halfe of that number added to the leſſer Meridian Altitude, expreſſeth the height of the Pole: But this muſt be noted that the heights ſeueral taken, muſt be counted from the ſame ſide of the Horizon.

The 13. Chapter doth ſhew you by the ſayling vpon the quarter of your compaſſe, in how farre ſayling you doe raiſe a degree, and what you do depart from the Meridian, and in the end there is a demonſtration thereof: reckoning it as you do ſaile vpon a flat, but not Spheral.

In going Southwards you raiſe the Equinoctiall & lay the Pole

Furthermore, becauſe there be ſome that deſire to knowe the alteration of a point, to this end, that in running vpon any point, they may know how much they raiſe or lay the pole ſooner vpon one point then vpon an other, I haue therefore thought good to ſet the matter downe briefely in this Chapter: in going to the North, you doe raiſe the Pole, and lay the Equinoctiall: contrariwiſe, going towards the South,

you

you lay the Pole, and raise the Equinoctiall. But in sayling or going East or West, you doe neither alter your Pole nor Paralell, but onely your meridian. Whereas in sayling vpon any other point sauing South and North, you do alter both your Pole and Paralell, and also your Meridian. Therefore I will open vnto you (in sayling vpon one of the quarters of the compasse) what distance vpon euery point doth raise or lay one degree, and how many miles you are distant from the Meridian of that place from whence you departed. But heere is one thing to be noted (as I suppose) in the most part of Cards they allow for euery degree but 17. leagues and a halfe. Your Cards be most commonly made in Lisshborne, in Portugal, in Spaine, or else in Fraunce. But as I take it, we in England should alow 60. miles to one degree, that is, after 3. miles to one of our English leagues, wherefore 20. of our English leagues should answere to one degree, for that 3. of our miles will not make one of their leagues, and because they make their accounts by their leagues in ẏ Cards, and not by ours, therefore I will shew you by our English miles. An English mile contayneth a thousand paces, and euerie pace 5. foote, and euery foote 12. ynches. Now some thinke that a pace cannot be fiue foote, but a pace Geometricall is two reasonable steppes, for it cannot be a pace, vntill the hinder foote be remoued forwardes, and those two steppes will containe fiue foote, and so may any man endure to goe at pleasure. But now to our purpose. For the sayling of one quarter of the Compasse, this is to be noted. First, that in sayling directly South or North, you do raise or lay the Pole a degree in threescore miles going. In the altering of one point from the South or North in threescore and one miles: and you be departed from the line of the North and South, or the Meridian 12. miles. In altering of the second point, you raise a degree in sailing threescore and fiue miles: and depart from your Meridian 25. miles. In altering of the third point, you do raise or lay one degree in sayling threescore and 12. miles, and a 9. part: and are departed from

In going to the Northwards raise the Pole & lay the Equinoctiall.

Of English leagues & Spanish leagues.

A degree is 60. miles or twentie English leagues.

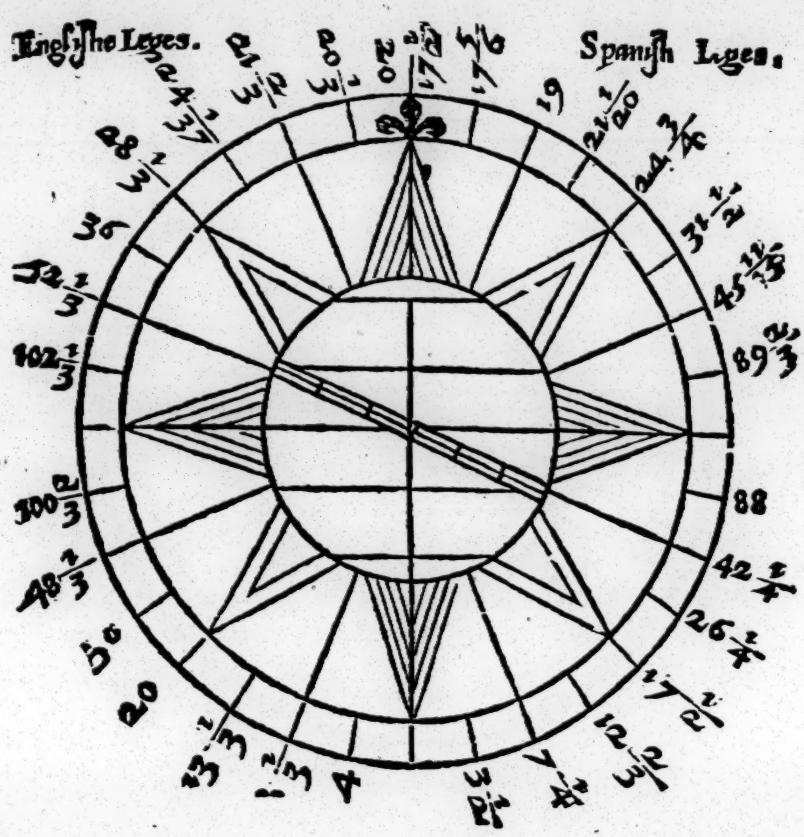
A note to know in how farre sayling you do raise or lay a degree, in the sayling by any one point of the compasse.

your Meridian 40. miles. Moreouer, in altering of the fourth point, you do raise or lay a degree in the going of foure score and fiue miles: and depart from your Meridian three score miles. In altering of the fift point or winde, you raise a degree in the sayling of 108. miles: and depart from your Meridian foure score and tenne miles. In sayling by the sixt point, you raise or lay one degree in 157. miles: and depart from your Meridian line 145. miles. Last of all, in sayling by the seauenth point or winde, you doe raise a degree in going of 308. miles: and depart from your Meridian line 302. miles: and after this maner you may consider of the other three quarters of the Compasse. But if you require to know the raising or laying of a degree by the leagues of the Cards: that is, at 17. leagues and a halfe: then behold the figure following, or reade the Art of Nauigation, and there shall you finde how many degrees you be departed from your Meridian, and also from the place that you departed from: and yet that serueth for none other place but onely for vnder the Equinoctiall, for he that maketh account of it in any other place, shall be deceaued: For euer as you goe to any of the two Poles, your degrees still be shorter and shorter, till such time as your Meridian meeteth vnder the two Poles, whereof I intreate in the sixteenth Chapter.

For the better vnderstanding of the things aforesaide, looke on this figure following. In the which figure you are to note this, that the numbers which are set vpon the vppermost quarter of the circle towards the left hand, expresse the English leagues, which we must runne vpon each seuerall point of the Compasse before we can raise or let fall the Pole a degree. The other numbers on the right hand are the Spanish Leagues seruing to the same purpose. The numbers set on the nethermost quarter of the circle towards the left hand, expresse the distance in English leagues from the Meridian, when we haue raised, or let the Pole fall a degree,

but

but those on the right hand are the Spanish Leagues expressing the same distance.



The 14. Chapter teacheth to know how farre any land is off from you, knowing but the distance betweene any two places: whether you run along by the land, or directly to the shore, or otherwise, with other necessarie things.

FOr that I know it very necessary and profitable for Sea-men to knowe how neere or farre they be into the Sea, and how neere to the land, I will intreate thereof for diuers considerations. And first, because in

in running alongſt the land there may be daunger, becauſe it may be ſuch a certaine quantity into the ſea, that they may go both within and without it. And alſo in like maner, being at one diſtance from the land, the land may riſe in ſuch a ſhape or faſhion, but being neerer, the land may riſe in an other forme or faſhion: for being farre off, you ſhall ſee the hills within the land, and being neere, the hills or cliffes neere vnto the Sea coaſt, may take away the ſight of the land within.

A note for the land, riſing in diuers ſhapes or faſhions.

Furthermore alſo it is very neceſſary, to know in what faſhion the land doth riſe vpon diuers poynts of the compaſſe, as oft as the faſhion of the land doth alter, and to note it in ſome booke for remembrance. Firſt by what points of the compaſſe, then the faſhion, and laſt, at how farre off. &c.

To know how far the land is frō you where two lands be but one poynt aſunder.

For knowledge how far off you be from the land, you may haue this help, if there be any two places by the ſea coaſt, whereof you know the diſtance, how many leagues or miles the one is from the other. In going alongſt the coaſt you ſhall ſet them with your compaſſe, and when you are thwart of them, if they be but one poynt aſunder, you ſhall be fiue times the diſtance betweene them from the land or ſhore. If the two places be two points aſunder, then the diſtance vnto the ſhore ſhall be two times and a halfe the diſtance. If three points aſunder, then the diſtance vnto the ſhore ſhall be once the diſtance and a halfe. If foure poynts a ſunder, the ſame diſtance ſhall be betweene you and the ſhore, that is betweene the two marks. If fiue poynts aſunder, then is it vnto the ſhore but two third parts of the diſtance betweene the two places. If fiue points aſunder, (you being thwart of one of them) then ſhall the diſtance vnto the ſhore be, not halfe the diſtance betweene the two places. And in all theſe caſes before rehearſed, the one place muſt be thwart of you, the other muſt be a head or ſterne of you: and ſo it is exact and true. As for enſample this: I going alongſt by ſome coaſt, doe know before hand one place to beare from an other Eaſt and Weſt: beſides this alſo I knowe the diſtance to be three leagues aſunder. When I haue brought one of the places South or

North

North of mee I doe set them with my compasse, the one being North of mee, and the other bearing North by East, that is one point asunder: Now the distance vnto the shore being fiue times the distance betweene the two places which bee three leagues asunder, I know the shore to be 15. leagues from mee, which (if the places were but one league asunder) should be but fiue leagues from the shore. Of two places to be one point asunder.

Furthermore, if the places be two pointes asunder, that is to say, the one North, and the other North Northeast, then shall the distance vnto the shore bee seuen leagues and a halfe from mee. Whereas if the two places were but a league asunder, it should be but two leagues and a half vnto the shore. To be two points asunder.

And furthermore, if the places be three points asunder, that is to say, the one North, and the other Northeast and by North, the distance vnto the shore shall be foure leagues and a halfe: whereas if the two places were but one league asunder vnto the shore, it should be but a league and a halfe. Three points asunder.

If foure points asunder, that is to say, if the one place be due North and the other place Northeast, then it is vnto the shore three leagues iust. If but one league asunder, then but one league vnto the shore. Foure points asunder.

Moreouer if the two places be fiue points asunder, that is to say, the one North, and the other Northeast and by East, then the distance vnto the shore shall bee but two leagues: whereas if the two places were but one league asunder, vnto the shore should be but two miles. Fiue points asunder.

Last of all, if the two places be sixe points asunder, that is to say, the one North, and the other East Northeast, then it shall not be a league and a halfe vnto the shore, &c. Sixe points asunder.

But if you come directly to the landwards, hauing no cause to be thwart of none of those knowen places, then to know how farre you bee from the land, you must doe as is by the places before spoken of. For if you goe due North, the one place being North and by West, and the other North and by East, then (the two places being three leagues asunder, you shall be seuen leagues and a halfe from the shore: so that if you runne into the shore due North, vntill they be foure pointes asunder, that is to say, the one North Of going or sayling into the shore.

Northwest, and the other North Northeast, then it shall bee vnto the shore three leagues, and three quarters.

And furthermore, you still running in due North till the two places be fiue points asunder, that is to say, the one place to be Northwest & by North, and the other place to be Northeast and by North, the distance vnto the shore shall bee two leagues and a quarter. And againe, if you runne in due North vntil they be eight points asunder, that is to say, the one place Northwest, and the other Northeast: then the distance vnto the land or shore, shall be but halfe the distance betweene the two places, that is, but one league and a halfe. Lastly, if you runne to the lande due North, vntill the two places be 10. points asunder, that is to say, the one place Northwest and by West, and the other Northeast and by East, then the distance vnto the shore shall be but one third part of the distance betweene the two places, that is, but one league from the land, &c. Thus much haue I said as touching the bearing of the land from you, by the points of the compasse, to know the distance, or how farre the land is off: which is very necessarie for Seamen to know, for diuers considerations, as I saide before.

A way to know how one head land beareth of another.

If now therefore you know not how one head-land doth beare from another, doe thus: in running alongst the coast: when you see the appearing of any land one before another, set them with your compasses, and looke how they beare from you, by what point of the compasse, and so shall you knowe iustly how the one land doth beare or lie from the other. And by this order you may correct your plats, by doing this, as often as you see two notable places together: As Ilands, rocks, head-lands, mouthes of hauens, sands, or whatsoeuer else be worthie of noting, this done, as often as you doe see them together, set them with your compasse, and that will shew you most certainely, that so they doe beare the one from the other.

To know the distance at Sea

You may know the distance in like manner betweene them, if you know your ships way, as thus: when you first see any two

two places together, as two head-lands, or two Ilands, hauing set them with your compasse, and knowing how the one beareth from the other, then for that you will not come nere vnto them, you doe hale off from the land vntill that you haue brought your selfe farre inough off, at your discretion, and when you be thwart of the first head-land, set the other land, and consider how it beareth from you: then reckon your ships way, how many leagues the ship might goe, vntill you come thwart of the other head-land, keeping your course along as the two head-lands beare, and so shall you both know the distance betweene the two places, and also how farre you be off from them. In like manner, hauing consideration of the distance betweeue the other places that you haue obserued, both by your compasse, and also the ships way, you may know how farre it is to the shore, going right to the land-wards, by your crosse staffe, although you knowe not the distance betweene any two places.

betweene any two headlands

To know how farre it is vnto the land an other way.

As thus: take the wideneſſe betweene any two places with your crosse staffe, bearing right to landwards, and then remooue the crosse staffe or Transuersarie, halfe the length of the Transuersarie, that is to say, the end next vnto you, and then by running in, till the two endes of the Transuersarie do agree with the two markes, you shall be halfe way to the shore: then looke howe farre the ship hath gone in the time, for the same distance is vnto the land from the ship. But if you remoue the Transuersarie but a quarter the length there of to you wards, then at the place where the end of the Transuersarie doth agree with the two markes, shall be one quarter of the distance betweene the shore and you at the first obseruation: and it shall be three times the quantitie vnto the shore, &c.

As I doe farther shewe the conclusions of the crosse staffe in my booke called The Treasure for Trauailers, the first booke the 10. 11. 12. 13. and 14. Chepters. And to knowe the shippes way, some doe vse this, which (as I take it) is verie good: they haue a peece of wood, & a line to vere out ouer boord,

To know the ships way.

boord, of a great length, which they make fast at one end, and at the other end, and in the middle, they haue a peece of a line, which they make fast with a smal thread to stand like vnto a crowfoot: for this purpose, that it should driue a stearne as fast the ship doth go away from it, alwaies hauing the line so readie that it goeth out so fast as the ship goeth.

In like manner they haue eyther an houre glasse of a minute, or else a knowen part of an houre, by some number of words or such other like, so that the line being vered out, may be stopt iust with that time that the glasse is out, or the number of words spoken, which done, they hale in the logge or peece of wood againe, and looke how many fadam the shippe hath gone in that time: that being knowen what part of a league so euer it bee, they multiply the number of fadames, by the portion of time or part of an houre. Whereby you may know iustly how many leagues and parts of a league the ship goeth in an houre, &c. As for example this: hauing a minute glasse (but it is better for to haue a portion of time by some number of words, and the lesser part of time that you haue, it is the better, for if that the ship doth goe very fast, you shal not haue to much line out, and if that the ship doth go but slowly, thē you may double the length of time by speaking the words twice or thrice ouer) let downe your logge handsomely into the water, and then let the line be marked according vnto the ship, a two or three fadame from the logge accordingly, that it be so farre a stearne that it commeth into quicke water, that the edie of the stearne doth not stay it, that being done, then begin to turne your glasse, or to speake your words, and stay it, iust at the end of the words, & then hale in your log againe, and measure how many foot or fadams that you haue vered or put out in that time, and suppose that your portion of time is a 120. part of an houre, more or lesse it maketh no matter, so that you do know the iust portion of time.

An English league is 2500. fadame.

A Spanish league is 2857 fadame.

Additions.

And suppose that you haue verred 25. fadames in the 120. part of an houre, therefore multiply 120. by 25. and of that multiplication there commeth 3000. fadame, and nowe an English

English league is 2500. fadame, so that the shippe hath gone one league and 500. fadames in an houre, and the saide 500. fadames is the fifth part of a league, so that the ship hath gone one league and one fifth part of a league in an houre. And this by multiplying the portion of time by the number of fadames you may keepe a verie good reckoning of your ships way, hauing this consideration, that you doe make as oftentimes proofe as the winde doth increase or decrease. Addition.

And for a good order in the keeping your account, doe this: Looke how long time that the winde hath blowne steddely without any increasing or decreasing, or altering of your course, then when that you doe see what or howe many fadames that the ship hath gone in an houre, multiply the saide number of fadames by so many houres as the ship hath gone by the said winde, and then diuide all that summe by 2500. or elle it is better to adde all your number of fadames as long as the ship hath gone one course without altering: as for ensample this. The ship hath gone foure houres 25. fadame, in the time of 120. part of an houre, that is in 4. houres 12000 fadame, and the wind encreasing, she went three houres 34. fadames. In 120. part of an houre, that is in three houres 1224 fadames, and the wind decreasing, the ship went fiue houres, but 16. fadames, in the 120. part of an houre, that is 9600. fadame in fiue houres, now adde all these numbers of fadams together, that is, 12000. and 12240. and 9600. and all these make 33840. So that the ship hath gone 12. houres 33840. fadames, and now diuide this summe by 2500. which is a league, and then there will stand 13. in the quotiente, and 1340. remaineth ouer. So that you may conclude, that the ship hath gone 13. leagues and a halfe, and 90. fadames: and by this meanes you may keepe a very good order in your reckoning, and so note it in your booke, and make a marke in your Cart, &c. And this is to be noted, that a Spanish or Portugall league doth containe 2857. fadames, and an English league but 2500. fadames.

The xv. Chapter or Rule, treateth of the Longitude, &c.

NOw some there be that be verie inquisitiue to haue a way to get the Longitude, but that is too tedious for Seamen, for that it requireth the deepe knowledge of Astronomie. For this they must consider, that the whole frame of the firmament is caried round from the East to the West, in 24. houres, so as there remaineth neither light nor mark, but goeth round, sauing only the two poles of the world & these two stand alwaies fast. But as I said before in the 9. rule of him that going South or North, doth raise or lay the Pole, and in like case the Equinoctiall, altering his Paralel, and causing the light of the Firmament to alter the time of their shining or abiding aboue our Horizon: so he that goeth directly East or West, doth neither raise nor lay the Pole, so that still the lights of the firmament doe make one manner of Arch, according to their Latitude or declination: but the going East or West doth alter the Meridian, causing the Planetes to haue their aspectes at another houre or time, altering the time of the Eclipses: which is necessarie for all trauailers by sea or by land to know. Therefore I thought it needfull to be spoken off: for as cuntries haue Latitude from the Pole, so in like manner they haue an appointed Longitude, you may get the Latitude with instrumentes, but the Longitude you must bring from another place, which you cannot do but with a Globe or else a mappe or Card, and then you must measure from the Meridian of the Canarie Ilands, otherwise called the fortunate Ilands. And in our Latitude of London, euerie 555. miles which containeth 15. degrees, will answere to one houre of time: and vnder the Equinoctiall 900. miles to 15. degrees: the degrees of Longitude vnder the Equinoctial, be as long as the degrees of Latitude, but

Altering the time of rising and setting of the lights.

Altering the aspectes.

Of Latitude & Longitude.

15. degrees is an houre of time, and at London it is 555 miles.

but towards the Pole they are lesser and lesser, till they come to nothing, vnder the two Poles with vs at London 37. miles will answere to one degree of Latitude, the Pole being raised betweene 51. and 52. degrees. The cause why the Longitude was fetched from the Canarie Ilands, I knowe not, but it was as I suppose, because it was the westermost place then knowen: for Ptolomeus was the first that ordained that rule.

Longitude beginneth at the Canary Ilands

Now furthermore, because you shall knowe this thing the better, I haue set forth in my 2. booke, called the Treasure for trauailers, certaine principal places in the whole world, both according to their Longitude & Latitude, whereby you may know what manner of Arch the Sunne with the other lights doth make, & also by the Longitude, you may knowe at what time the Moone doth make any aspect with any of the Planets. Besides this, you may know the Eclipses of the Sunne or Moone, with the chaunge quarters, and full Moone in all places at the verie true houre and minute of time of the Diameter. If you haue a true, and an exact Ephemerides, & consider diligently for what Longitude or place your Ephemerides was made. The Longitude may be found at ỳ time of the Eclipses of the Moone, so that she be aboue your Horizon in any place vpon the superficies of the earth, or sea in this manner.

To know the true time of the aspects of the moone.

Seeke out in the Ephemerides, the time of the Eclipse, obserue, also diligently the iust time, wherin you see the Moone Eclipsed, compare the saide time with the time set downe in the Ephemerides, if they do both agree, then are you in the same Longitude, and vnder the Meridian of that same place for the which your Ephemerides was made. But if the two times cõpared together do differ, then are you either to the East or Westward of that place, for the which your Ephemerides was made. If that the time wherin you obserued the Eclips be lesser then that, which is set down in the Ephemerides. Then are you to the Westward, but if it be greater, then are you to the Eastward of that place, for which your

Ephemerides

Ephemerides was made. How much you are to the East or Westward may easily be knowen by the difference of time and the degrees of Longitude aunswerable thereunto. Unto euery houre there are ascribed 15. degrees to euery halfe houre seuen degrees and a halfe, and so consequently following that rate as the difference of time is more or lesse. If the time noted in the Ephemerides doth differ an houre from the time of your obseruation, then doth the place wherein you obserued the Eclips differ in Longitude from the place, for the which the Ephemerides was made, 15. degrees, if two houres, then is the difference of Longitude 30. degres, &c. These degrees aunswerable to the difference of time, and expressing the difference of Longitude must be subducted if your obseruation of the Eclips were made to the Westward, otherwise they must be added to the longitude of the place, for the which the Ephemerides was made, so shall you finde the true Longitude of the place in the which your obseruation was made.

The Longitude is not to be gotten with instruments on the Sea.

And furthermore you might knowe your Longitude with the Ephemerides, by the coniunction of the Moone with other fixed starres, if it were not for one great infirmitie, and that is the paralles of the Moone, which the semi-diameter of the earth doth cause, by neerenes of the Moone vnto the earth: wherfore I would not haue any man think that the longitude is to be found at Sea by instrument. Therefore let no Seamen trouble themselues with any such rule, but (according to their accustomed manner) let them keepe a perfect accounte and reckoning of the way of their ship, whether the shippe goeth to leewards, or maketh her way good, considering alwaies what things be against them or with them, as tides, currents, windes, or such like.

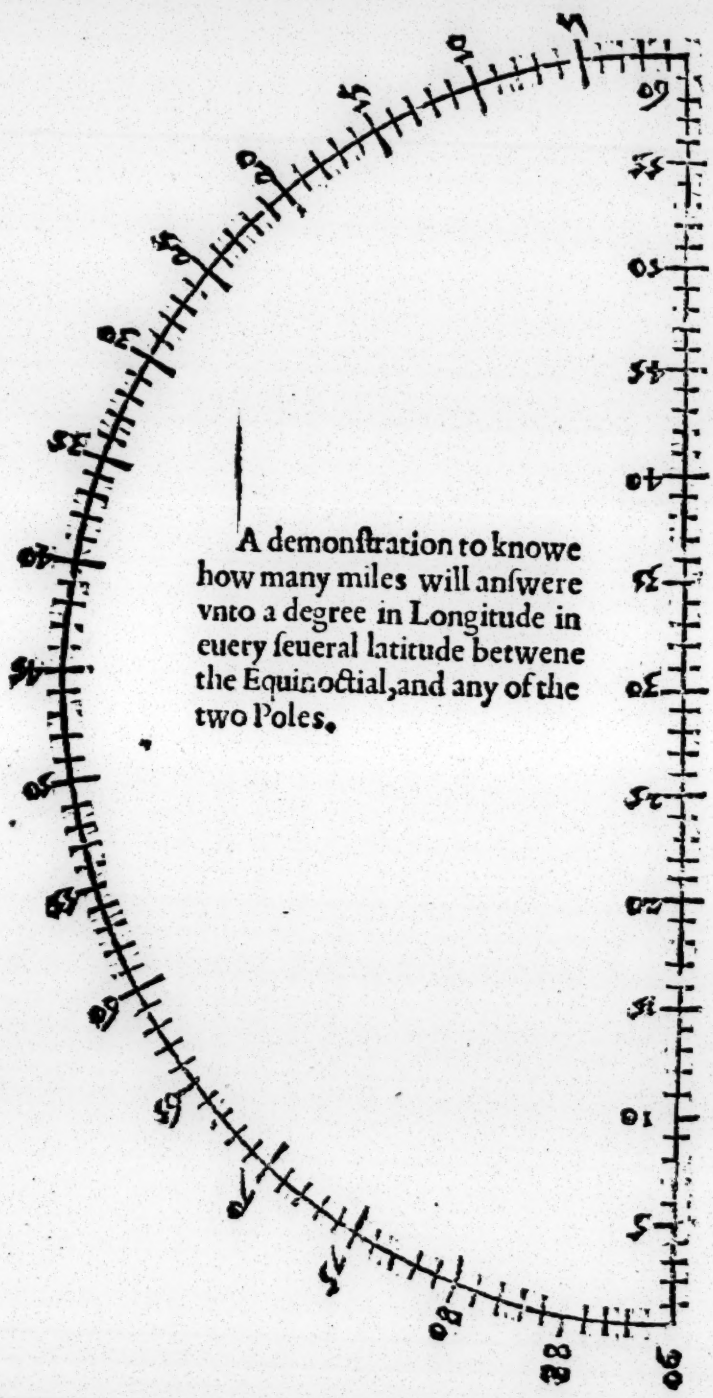
The xvj. Chapter sheweth how many miles will answere to one degree of Longitude, in euery seuerall Latitude, betweene the Equinoctiall and any of the two Poles: with the demonstration for that purpose, and the diuersities of affects of the Moone.

NOW by this rule shall I teach you how many miles will aunswere to one degree, for euerie seuerall Latitude, betweene the Equinoctiall and any of the two Poles either Arctick or Antarcticke. And first vnder the Equinoctiall, (the two Poles being euen with the Horizon) 60. miles do answere to one degree, as I sayd in the 15. Chapter.

And now shall follow the rest. Where the Poles be rayled 21. degrees 56. miles belongeth to one Degree of Longitude. Now the Poles being raised 29. degrees 52. miles doe answere to one degree. The Poles being rayled 36. degrees 48. miles do answere to one degree.

The Poles 42. degrees raised 44. miles goeth to one degree of Longitude. The Pole raised 48. degrees 40. miles to one degree. The Pole rayled 53. degrees 36. miles to one degree. The Pole rayled 57. degrees 32. miles to one degree. The Pole raised 62. degrees 28. miles to one degree. The Pole raised 66. degrees. 24. miles to one degree. The Pole rayled 70. degrees 20. miles to one degree. The Pole raised 74. degrees. 16 miles to one degree. The Pole raised 78. degrees. 12. miles to one degree. The Pole rayled 82. degrees. 8. miles to one degree. The Pole rayled 86. degrees 4. miles to one degree. The pole being raised to the highest at 90. degrees (being then your Zenith) there all the Meridians meete. And now shall folow a demonstration of halfe a circle, and that shall shew you how many miles will make a degree, according vnto euerie Latitude that you are in, by the applying of the one foote of a payre of Compasses, or by making a

thread fast to the lower corner of the halfe circle at 90. and by extending of the other foote of the Compaſſe, or by laying



A demonſtration to knowe how many miles will anſwere vnto a degree in Longitude in euery ſeueral latitude betwene the Equinoctial, and any of the two Poles.

the thread vpon the latitude of the place wherein you are, the which Latitude or eleuation of the Pole is marked by seuerall degrees in the halfe circle, and in the Diameter are marked the miles answering to euerie Degree. Your compasses therefore being extended, or the thread being applied from 90. to the Latitude of the place wherein you are, turne the Compasses or the thread downeward to the Diameter, for the number vpon which the foote of the Compasses, or the end of the thread lighteth, expresseth the miles answerable to each degree of Longitude in the Paralel of the Latitude propounded. The reason is this, because all Circles be in proportion correspondent vnto their Diameters. Now you must consider (as it was partlie noted before) that vnto euerie houre of time in the chaunging of the Moone or of the Eclipses, you must alow 15 degrees, and vnto euery degree you must alow so many miles as you do see in your former instrument to be aunswerable to the Latitude of the Countrie, in this manner: those places that be to the Westwards of your towne, place, or countrie, by 15 degrees, the Moone shall change rather with them then with you by one houre, because that they shall touch your Meridian before theirs by one houre. And if the towne or place be to the Eastwards of you by 15 degrees, then shall the Moone change rather with you than with them by one houre, as for ensample thus. If so be that with vs at London the Moone shall change vpon any day at 12 of the clocke at noone 5 minutes to the Westwards as farre as Lisshborne in Portugall, the Moone shall change that same day at 11 of the clocke 43 minutes, the longitude being thereof from the Canarie Ilands fiue degrees 36 minutes. Now to the Eastwards, the same day at Rome the Moone shall chaunge at two of the clock 31 min. because that they haue Longitude 36 degrees 40 minutes from the Canarie Ilands, and then by this account 7 degrees and a halfe will answere to halfe an houre, and then three degrees and three quarters wil make a quarter of an houre, and then nine miles and a quarter will make one minute of time

15. degrees answereth vnto an houre of time.

with vs at London in our latitude, so by this rule you may know at what time and minute the Eclipses or chaunges of the Moone doe happen, knowing for what place your Almanake was made, as commonly we heere in England do make them for the Cittie of London.

To know the true time of the change and quarters of the moone, is a question Astronomical, Geometricall, and Cosmographicall.

Thus much haue I said as touching the true time of the chaunge of the Moone, for that some people (as I haue said before in the third Chapter) do contemptuously say, why do they not giue or make rules for euer, to know the houre and minute of the change, full, and quarters of the Moone? And yet they be vtterly voide of any knowledge in the Mathematicall science, whereby they might know the true time of the chaunge of the Moone: For it is a question Astronomicall, to knowe the Moones motion: a question Geometricall, to knowe the true time of the aspects, or measure betweene the Sunne and the Moone: and thirdly, it is a question Cosmographicall, to know the true Longitude of the place he is in, at the time when the Moone chaungeth, &c.

Now followeth the next rule which shall treate of Longitude and Latitude.

The seuenteenth Chapter sheweth the Circumference of the whole Earth and the Sea, vnder sundrie Parallels, whereby that any Sea-man may know what quantitie or part of the earth that he hath sailed, or passed, by the number of leagues, and also he may know the alteration of time, &c.

Additions.

AND now furthermore I doe thinke it necessarie for to shew the Circumference of the whole earth, in sundrie Latitudes from the Equinoctiall, whereby in sayling you may knowe what quantitie or part of the whole earth you haue passed or gone, and also

so what the diuersitie, aspect, or time is wherein you haue transported your selfe from any place assigned, which is necessarie for them that should go any long voyage.

Under the Equinoctiall the whole earth is in circumference 7200 leagues, attributing 20 leagues to a degree, and the halfe thereof is 3600 leagues. In that Paralell it is mid night to one, when it is high noone to an other, and the quarter of the compasse is 1800 leagues, and there the diuersitie of time is altered fiue houres, & then in 900 leagues the time is altered three houres: so that in the sayling East or West vnder the Equinoctiall three hundred leagues, shall alter one houre of time in the Eclipses or the chaunges of the Moone, &c.

Furthermore, where the Pole is raised 20 degrees aboue the Horizon round about the earth keeping the paralell, the whole compasse is 6766 leagues, and the halfe of it is 3383 leagues, and there your noone is midnight, and then a quarter of that Paralell is 1691 leagues and a halfe, and there the alteration of time is fiue houres, and then 846 leagues doth alter three houres of time, so that 282 leagues doth alter one houre, in the change or Eclipses of the Moone, &c.

In the latitude of 30 degrees from the Equinoctiall, the compasse of the earth vnder that Paralell is 6236 leagues, and the opposite part in that Paralell is 3118 leagues, and there noone is midnight, and then the quarter of the compasse of the earth is 1559 leagues, and then passing in that paralell 779 leagues and a halfe, doth alter three houres of time: so that 260 wanting $\frac{1}{3}$ leagues, shall alter one houre in the aspects of the Moone, and also in the Latitude of 40 degrees from the Equinoctiall, the whole compasse of the earth and sea vnder that paralell is 5516 leagues: So the halfe is 2758 leagues, and a quarter is 1379 leagues, so that 689 leagues and a halfe, shall alter three houres of time, and 230 leagues, wil alter one houre of time in the Eclipses or aspects of the Moone, &c.

Where the Pole is raised 50 degrees, there the circum-

ference of ỳ whole earth vnder the paralel is 4628. leagues, and a halfe thereof is 2314 leagues, and the quarter thereof is 1157 leagues: so that 578 leagues and a halfe, doth alter three houres of time: and 193 leagues doth alter one houre of time in that paralell. In the Latitude of 60 degrees from the Equinoctiall in that paralell, it is but 3600. leagues, to goe round about the whole earth and sea, so that 1800 leagues is the oppolite part of that Paralell, and there your noone is midnight, so that 900. leagues shall alter fire houres of time, and 450. leagues, three houres of time, and 150. leagues shall alter one houre of time in the aspects of the Moone, being the 24. part of the compasse of the earth, in that paralel. &c.

Where that the Pole is rayled 65. degrees, there the circumference in the paralell is 3042. leagues, so that the halfe is 1521 leagues, and a quarter of that Paralell is but 760 leagues and a halfe: So that 380 leagues shall alter three houres of time, and 126 leagues and $\frac{2}{3}$ shall alter one houre of time. &c.

And also in the Latitude of 70. degrees, the compasse of the earth is in the paralell 2462. leagues, so that the oppolite part is 1231 leagues & the quarter is 616 leagues and a halfe, so that 307 leagues and three quarters, doth alter three houres of time, and 102. leagues will alter one houre in the Eclipses or change of the Moone. And furthermore, in the Altitude of the Pole 75. degrees, there the compasse of the earth in that paralell, is 1864. leagues, and the halfe is 932 leagues, and the quarter is 466. leagues, so that the alteration of three houres of time is 233 leagues, and 77 leagues & 2. miles wil alter an houre of time. &c. And also in the Latitude of eightie degrees from the Equinoctiall, there the whole circumference of the earth vnder that Paralell is but 1250. leagues. And the oppolite part in that Paralell is 625. Leagues, and then the quarter of that, is but 300. & 12. leagues and a halfe, so that 156 Leagues will alter three houres of time, and fiue and twenty leagues will alter one houre,

houre, in the time of any Eclipse or any aspects of the Moone, so that you may see how short that the Circumference of the earth is, at the Latitude of eightie degrees: and this I doe cease to shew any further towards the Pole-wards, for that it is doubtfull whether that it is Nauigable so neere vnto the Poles. &c.

The eighteenth Chapter or rule, sheweth how to sayle by the Globe.

NOW to sayle by the Globe, it is conuenient to be spoken of: For that generally the most part of the Sea-men make their account as though the earth were a flatforme. For they do not consider that the earth is a Globe, and that the Meridians doe grow narrower and narrower towards the Poles, for it is vnpossible to draw the face of the earth and the Sea true vpon a flatforme, for if you will describe the land true, then shall not the Sea be true if your lynes be made according to the arte of Hydrographie, for the Sea shall be broader to the North partes than it is, because the Meridians grow together. Now and if you would describe the Sea true, with lynes, courses, distances, hauens, and daungers, then should your land be broder to the North parts than it is. As for ensample thus: England and Scotland being both one Iland, in all your Cardes of Nauigation, that doth shew any part to the South-wards, the North part of Scotland is drawen much bigger than it is, for otherwise the lynes of South and North should not be according to the trenting of the land, for if you view it well, you shall finde the North end of Scotland much more in distance than it is. As you may see in measuring it by the trunck of your carde.

You cannot draw the land & Sea true vpon a flatting.

To make a sea plat or Carde.

For your better vnderstanding, I haue shewed the compasse of the earth vnder sundrie Latitudes in the Chapter going before, and by that you may see that the compasse of the East and West lyne (comming from the Equinoctiall) is

is much lesser to the Northwards, than it is to the Southwards. Wherefore when you shall haue any occasion to attempt any voyage to the North parts, it is best to sayle by a Globe: for so shall you better see the distance and bignesse of the lands, and in like manner your lines and courses. In this order, first (according to the accustomed manner) keepe a perfect account and reckoning of the way of the Ship, by what lyne or poynt your Ship hath made hir way good, then must you resort to your Globe: after that consider what place and paralell you be in, which you may do by the Sunne by day, and by the Starres by night. Now (knowing what place and Paralell you be in) set your Globe to the eleuation of your Pole: that done, turne to the place of your Zenith, and seeke the opposite of it in your Paralell: for then you know that in the same Paralell is your East and West lyne: that had, the iust quarter of that circle to the Pole, must be deuided into the eight points of your compasse, doing so likewise on the other side.

How to vse the Globe to direct your course, and to know how that any place doth beare.

In like case if you come to the Southwards, deuide your eight windes from your Antarctick Pole, to your Paralell circle: and thus must you do euer and anon, for the oftner you do obserue this custome, the better and perfecter shall your course be. Now thus briefely I make an end of the sayling by the Globe. But for them that do occupie the South parts, nothing is better then their cards. Because I haue declared vnto you the length of certayne of the paralels, what leagues the earth doth contayne in compasse vnder them, now will I shew you how many leagues distance there is, from one paralel vnto an other, accordingly as I haue set downe in the Chapter next going before this, where I do shew the circumference first vnder the Equinoctiall, and then in the Latitude of twenty degrees, and then 30. degrees. &c. First from the Equinoctiall vnto the latitude of twenty degrees is 400. leagues, and from 20. degrees vnto 30 degrees in Latitude, is 200 leagues. The like is from 30 vnto 40. degrees, and from 40. to 50. and from 50. to 60. So that there is from the

the Latitude of 60. degrees vnto the Equinoctiall 1200. leagues, and there a degree of Longitude is but halfe so much as it is vnder the Equinoctiall, and the whole circumference of the earth but halfe so much, in like manner from the Latitude of 60. degrees vnto the Pole is but 600. leagues, and there all the Meridians doe meete: and it is from the Equinoctiall vnto either of the two Poles of the world 1800. leagues, &c. which is the fourth part of the compasse of the whole earth.

The cause why that you may see the sailes of a ship, and not the hold.

Furthermore, for that you may the better vnderstand, that the earth is a Globe or Circular (which any person that doth occupie the Sea, seeth most apparantly) you shall perceiue it thus: if you see a ship any thing farre off, you may perfectly see the saile of it, but not the hold, the cause wherof, is the circularnesse of the earth, and the water of the Sea: for that the water doth arise and swell betweene you and the other ship, according to the distance betweeene both the shippes, because the distaunce to the Center of the Earth or Water, is in euery place alike. And hee that hath desire to know further heereof, M. Dee hath made mention thereof in Euclides Elements, in his Mathematicall preface, and also in the twelfe booke, whether you may haue recourse: yet notwithstanding I will say a little therof, whereby you may discerne how farre it is possible to see a ship vpon the Sea: if you be on the sea in a ship, so that there be but halfe a league betweene you and the other ship the water will be fiue inches and a halfe higher in the middle of the way betweene both the ships, for that the water is of equall distance in euerie place from the center of the earth, and runneth in a crooked line the which crooked line being subtended by a right line, the middlemost line betwene two shippes that commeth from the center of the earth, shall be shorter then the other two lines comming from the Center of the earth, vnto the two shippes by fiue ynches and a halfe, then it must needes be said, that the water is higher by the saide fiue ynches and a halfe. And furthermore if the two shippes were a league

aſunder, then the water by his circulerneſſe ſhould be 22. ynches higher than the leuell in the middle betweene both the ſhips.

To know how many foot and ynches that the water is higher than the leuell or the Sea, betweene two ſhips.

Furthermoze, if the two ſhippes be two leagues aſunder, then the water ſhall be higher then the leuell in the middle betweene both the ſhips, by 88. ynches, which is ſeuen foote and foure ynches. If the two ſhips be three leagues the one from the other, then the water ſhall be higher than the leuell in the midway betwene both the ſhips, by 198. yuches which is 16. foote and a halfe.

Furthermoze if the two ſhips be foure leagues aſunder, the water ſhall be higher than the leuell in the midway betweene both the ſhips, by 252 ynches, which is 29. foote and foure ynches. And furthermoze, if the two ſhips were fiue leagues aſunder, the water ſhould be higher than the leuell of the midway betwene both the ſhips, by 550. ynches, which is 46. foot lacking two ynches. Yet foꝛthermoze, if the two ſhips were ſixe leagues aſunder the water ſhould be higher than the leuell in the middle way betweene them by 792 ynches, which is 66. foote. Furthermoze alſo, if the two ſhips were ſeuen leagues aſunder, the water ſhould be higher then leuell in the midway betwene both the ſhips by 1878. ynches, and that is 90. foot, which is as farre & rather farther than it is poſſible to ſee any ſhip vpon the Sea: Neither is it poſſible to ſee any land further, but ſuch land as is very high land, which foꝛ the greatneſſe of the height may be ſeene, wherefoꝛe ſixe leagues oꝛ ſeuen leagues is called a kenne.

What a kenne is, the cauſe why you may ſee a ſhip farther out of the top than vpon the hatches.

Now the circulerneſſe of the earth is the cauſe why you may ſee a ſhip oꝛ land further out of the top, than vppon the hatches: wherefoꝛe it is a plaine caſe, that the earth and ſea is not flat, but circuler, as is afoꝛe declared, &c.

The

The xix. Chapter, is as touching the making of Plats or Cardes for the Sea, and not to paint their Cardes as they do, but rather to supplie the vacant places with other necessarie matters: and also of three neneceſſarie things contained in the Plats or Cards, and their vſes, which is the moſt neceſſarie thing in nauigation.

FOR the making of Plats or Cards, as touching Hidrographie, commonly called Sea Cardes, I meane to say little thereof: for that it is sufficiently declared in the booke called the Art of Nauigatiõ: sauing this, I would wish them that be makers of Plats and Cards for the Sea, not to paint their compasses with so many colours: neither vpon the land with so many flags, for that it doth rather hurt than good: although it may be said, they be so painted in vacãt places, those vacant places I would wish them to furnish with these two matters, in this order. First, in some vacant place to make a compasse, and to place against euery point of the halfe of the compasse, letters, or some other figures or caracters, and in like manner, to make that letter or carecter at the hauen, port, or place where the moone maketh a full sea, being vpon that point of the compasse, vpon which the said letter or carecter doth stande: as for ensample thus: I place A at the East point. B at the East and by South. C at the East Southeast. D at Southeast and by East, and so consequently to all the points vnto the West, then that being done, where it floweth an East Moone, I place A in the Plat or Carde and where an East & by South Moone, I do place B in the the Card, and so forth, according to the place of the Moone that maketh a full sea. And where it runneth halfe tide vnder other, to make some note vpon the Card in that place, &c.

Not to paint their sea cards, but to vse the vacant places, with other necessary matter.

This also is verie necessarie to be done, to furnish vp all the vacant places of the Plat or Carde, to drawe the shape or fashion of euerie head-land or high land alongest euerie coast

To draw the shape of the land in their Cardes.

that is needfull to be knowen, and at what point of the compasse the land is of that fashion: at how farre off the land riseth in that fashion: and so to make a fashion of the land as often as the land altereth the forme and fashion: and last of all, at what poynte of the compasse the lande hath that shape or fashion: for beeing vpon one side, the lande riseth of one fashion, and on the other side, of another forme or fashion.

And being neere the land, it will be in one fashion, and being farre off in another fashion (as is before declared in the 14. Chapter) for there is nothing more needfull and necessarie for a Sea-man than this: to know the land when he seeth it, and there is no way better to make him remember it, than to haue notes howe the lande doth rise vpon euery side, and what greater inconuenience may there growe by any meanes, then there may bee by mistaking of a place: for it were 20. times better to be throughly perswaded, that he knoweth it not, than to thinke he doth know it, not being that place. For whereas he doth thinke to preuent the daungers, he may willingly runne vpon the daungers, not knowen of him. Therefore in my opinion they can doe no better than to furnish their vacant places in their Plats and Cards with this matter. The vse of the Sea Cardes is most necessary for Nauigation for long voyages: first, for that it sheweth youhow one place beareth from another: secondly the distance of any place how farre the one is from the other: Of which the one is represented by the lines of the compasse: the other by the scale or trunke of measure, if the Plat be truely made: thirdly, it sheweth you in what latitude from the Equinoctiall or altitude of the Pole any place is in, by the line of degrees.

Great infirmities by mastaking any place

How necessary a thing the sea Cardes bee.

Three necessarie things in the sea Cards.

Now to direct your course through the Sea by the Card, to any place assigned, you must first looke by what point of the compasse it beareth from you, from the place you meane to set off from the land, vnto the place you would first fall with. Which you shall know thus: seeke a line from the next compasse, vnto the place you meane to depart from, then open your

To know how any place doth beare frō you, by the Card.

Compasses

Compasses vnto one of those lines by your iudgement that falleth neere vnto your place assigned: and let the other foote of your Compasses stand iust at that place where your Ship is, when you direct your course: that done, beare your hands forwards euen, and let the one end be still vpon the line to the which you did open your Compasses, vntill you come to your place assigned. But if it falleth short of the place assigned, then take the next line nearer vnto the place you departed from: when you haue so done, if your Compasses doe ouerreach the place assigned, then take a line further off from the place you doe meane to set off from: and so shall you see by what point of the compasse the place assigned doth beare from you, &c. If you would know how far the place assigned is from you, set the one foote of the compasses vpon the place you depart from, and stretch out the other foote vnto the place assigned iust, that done (keeping your compasses at that extent) set them to the scale or trunke of measure, and that will shewe you iustly how many leagues it is from the place of your departing vnto the place assigned. If the distance betweene the two places be more than the compasses will reach at once, then first set your compasses vnto the scale, opening the compasses vnto 100 leagues more or lesse, as your scale and compasses will giue you leaue at your discretion, after that set the one foote at the place of your departing, and the other foote of ỹ Compasses right towards the place assigned, as oftentimes as the distance betweene the two places doth require, and then (the compasses being opened vnto 100. leagues) you may conclude it to be so many hundred leagues vnto the place assigned, as the compasses did shew vnto you: but if there be any odde measure, then open your compasses to that quantitie, and set that to the scale, and it will shew you the iust content of that measure, more than so many hundred leagues, &c. Furthermore, touching the third commoditie which is to know what Latitude, any place assigned hath: set one foote of the compasses vpon the place assigned, and open the compasses vnto the next East and West line, then

To know how farre it is vnto any place by the Carde.

To know what latitude or height of the Pole any place hath by the carde.

then carrie that vnto the line of Degrees, keeping the foote of the compasses vnto the East and West line, it will shewe iustlie the number of Degrees that the Pole is aboue the Horizon.

So of these three waies, by the first is knowen by what point of the compasse any place beareth from you. By the second is knowen how farre distance it is vnto any place assigned. And by the third is knowen in what height the Pole is, in any place assigned, &c. (Now this being knowen) you may with the more ease know how to attaine to come vnto the port or place assigned.

Yet furthermore there is to be considered in (directing the course of a Ship to any place assigned) what impediments may be by the way: as tides, currents, or the scantnesse of the winde, which may put the Ship vnto the leewards of his course, as also the surging of the Sea: and all this must be considered by the maister and Pilot of the Ship. Likewise also in long voyages, the winde may often shift vpon him, and sometime the winde may be such as he cannot lye his course: wherefore he must keepe a perfect account of the Ships way, and consider what poynt the Ship hath made hir way good by. And at euery time that the winde doth shift, and the Ship cannot lye hir course, to note in the Card or Plate in what place the Ship may be: in hauing a speciall regard vnto the way of the Ship, as touching the swiftnesse or slownesse that the Ship goeth: and if so be the weather be cleare either by night or day, to take the true Altitude of the Pole: for by that they may correct the Ships way, and giue a verie neare gesse, how the place (assigned to goe vnto) doth beare from them, as also how farre it is thether, sauing onely in the East and West course: and then they haue no other help but onely the very account of the Ships way.

Things to be considered by the Maister or Pilot of a Ship.

They may correct the Ships way by the taking the height of the Pole.

And to correct their dead reckening by the Altitude of the Pole, they must doe this: (especially if the Ship haue had often trauerse, by the meanes of contrary windes, so that she could

could not lye hir course,) consider vpon the Carde or Plat how long the Ship hath made hir way good, for so many poynts as the Ship hath sayled by: then (if by the Altitude of the Pole the ship hath gone more than the dead reckening did shew you) repaire vnto the line of degrees, and set the one foote of the Compasses vppon the degree and place of the height of the Pole, and the other vpon the next East & West line: that done beare it vnto the place you suppose the Ship to be in, and then bring forwards with the other Compasses, what poynt of the Compasse the ship hath sailed by, and at the meeting of the two payre of Compasses, make a note for the place that the Ship is in: from which place you may with your Compasses see, how the place assigned doth beare, and also how farre off you be from the same.

Furthermore (if you finde by the height of the Pole that you are not so farre shot, as your reckening did show vnto you) you must pull backe so much from the poynt that the Ship hath sayled by, as the height of the Pole doth shew vnto you by the order before rehearsed. &c.

To know how farre that the land is of from you by the sight of the land with your compasse, to do it vpon the land.

Furthermore (as I haue declared vnto you in the 14. Chapter going before) how to know how farre the land is off from you, (the distance betweene any two places being knowen, by setting ẏ land with your Compasse, euen so you may do the like by your Card, as thus: setting the two places with your Compasse, and knowing that the two places be so many leagues asunder, then shall you repare to the Card, and according to the bearing of the two places by the points of the Compasse, you (being thwart of one of those two places) shall apply it with your Compasses vnto your Scale: But for that in the Scale the leagues be so small, you may assigne twenty leagues to be but one league, and open the compasses vnto that proportion that the two places be asunder, and the one of them doth beare from the other: that done, open the Compasses againe from the Center of the Compasse, vnto the place that you doe imagine to be the Land, and then apply it vnto the trunke of measure, and you shall see how many

many Leagues you be from the shore, and so forth. So that you may see that the Plat or Card is one of the necessariest things that is to be vsed in Nauigation. If you desire a full and perfecter vse of the Carde, reade the booke called The Mariners guide, wherein the vse of the Carde is handled at large.

The 20. Chapter is of the Longitude and declination of 32. notable fixed Starres, very necessarie for Nauigation, with tables of their shining, and at what point of your Compasse they do both rise and set: and also tables for euerie moneth of the yeere, declaring at what houre and minute they be South, running from the first day of the moneth to the fifteenth, and from the fifteenth to the last day, and will continue these 100. yeeres without much error.

AND furthermore, I doe thinke it conuenient for diuers considerations, to shew the longitude and declination of certaine of the most notablest fixed Starres that are neere vnto the Equinoctiall, to the number of 32. of them, which are verie necessarie for Nauigation in diuers respects, as this: if you be vnto the North parts where the North Pole is raised more than 50. or 60. degrees, then the North starre is too high to be obserued or taken with the Crosse staffe, (as I haue declared in the first Chapter) and it may chaunce so that in the day the Sunne is not to be seene at noone, and then these starres may serue your turne in the night.

If the Pole be raised more than 50. or 60. degrees, it is to high to be obserued by the crosse staffe.

And furthermore they be very good for them that haue occasion to trauaile beyond the Equinoctiall, where the North Pole is vnder the Horizon, in vsing their declination as they do the sunnes declination in all points, which doth appeare in the 7. 8. and 9. Chapters of this booke. And furthermore

These starres will serue beyond the Equinoctiall.

thermoze they be very neceſſarie foz ſea-faring men to know the houres of the night, both by their being vpon the Meridian, and alſo by their riſing and ſetting: you may knowe the true time of their riſing and ſetting in euery Latitude by their declination from the Equinoctiall, whether they decline to the South parts, oz Noꝛth parts, as is declared by the declination of the Sunne in the 11. Chapter.

To know the riſing and ſetting of the ſtarres in all places by the order of the xi. Chap.

And furthermoze, by any of the Starres you may try the variation of your compaſſe by night. &c. Now ſhall follow the Table of all theſe ſtarres. The firſt row of this Table containeth the names of the ſtarres. The ſecond, the ſignes wherevnto the Longitude of the ſtarres is referred. The third, the degrees of the ſignes. The fourth, the minutes belonging therevnto. The fifth, the degrees of declination. The ſixt, the odde minutes belonging therevnto. The ſeauenth ſheweth towards what part they decline, by letters, of which N. ſignifieth Septentrionall, oz Noꝛth declination, S. ſignifieth Meridionall, oz ſouth declination: as in the Table doth appeare. The eight doth ſhew nothing but the bigneſſe of the ſtarres. Now followeth the Table.

The order of the Table following.

A Table of fixed Starres newly corrected by *T. Hood* according to their longitude. 1600.

The names of the starres	Signes.	Longi. deg.mi.	Declin de. mi.	To what part the starrs decl.	The mag. or highnesse of the starres.
Whales backe	Aries	6. 25	11.49	S declin.	3 mag:
Whales belly	Aries	16.25	12. 0	S declin.	3 mag:
Rammes horne	Aries	28. 5	17.39	N declin.	3 mag:
Rammes head	Taurus	2. 25	19.31	N declin.	3 mag:
Bulles eye	Gemini	4. 5	15.56	N declin.	1 mag:
Orions left foote	Gemini	10.35	9. 7	S declin.	1 mag:
Orions left shoulder	Gemini	14.45	5. 14	N declin.	1 mag:
Orions girdle the middlemost.	Gemini	18.45	1. 44	S declin.	2 mag:
Orions right shoulder	Gemini	23.25	6. 21	N declin.	1 mag:
Great Dogge	Cancer	9. 5	15.54	S declin.	1 mag:
Lesser Dogge	Cancer	20.35	5. 55	N declin.	1 mag:
Brightest in Hydra	Leo	21.25	5. 4	S declin.	2 mag:
Lions necke	Leo	23.35	21.42	N declin.	2 mag:
Lions heart	Leo	23.55	13.44	N declin.	1 mag:
Lions backe	Virgo	5. 35	22. 8	N declin.	2 mag:
Lions taile	Virgo	16. 5	16.26	N declin.	1 mag:
Rauens head	Libra	5. 45	20.15	S declin.	3 mag:
Rauens wing	Libra	9. 25	14.31	S declin.	3 mag:
Virgins spike	Libra	18. 5	8. 58	S declin.	1 mag:
Arcturus betwixt Bootes legges.	Libra	18.25	21.49	N declin.	1 mag:
South balance	Scorpi.	9. 25	14. 2	S declin.	2 mag:
North balance	Scorpi.	13.35	7. 50	S declin.	2 mag:
Scorpions heart	Sagit.	4. 5	24.57	S declin.	3 mag:
Hercules head	Sagit.	16.15	13. 3	N declin.	3 mag:
Serpents head	Scorp.	10.15	21.14	N declin.	4 mag:
Eagle	Capri.	25.15	7. 37	N declin.	2 mag:
Dolphins taile	Aquar.	9. 5	10.10	N declin.	3 mag:
Goats taile	Aquar.	16.45	17.55	S declin.	3 mag:
Aquarius legge	Pisces.	3. 5	17.29	S declin.	3 mag:
Pegasus shoulder	Pisces.	18. 5	13.22	N declin.	2 mag:
Pegasus legge	Pisces.	23.35	25.44	N declin.	2 mag:
Whales taile	Pisces.	27. 5	19.44	S declin.	3 mag:

The

The vse of this Table is this: when you haue taken the height of any of these starres vpon the Meridian, then looke what declination the starre hath from the Equinoctiall, and whether it declineth toward that pole, which is aboue the Horizon, or toward that pole which is vnder the Horizon. If the starre declineth toward that pole which is aboue the Horizon, substract the declination from the meridian altitude thereof, the remainder giueth the height of the Equinoctiall. If the starre declineth toward that pole which is vnder the Horizon, adde the declination to the meridian altitude thereof, the totall summe giueth the height of the Equinoctiall, and then by the height of the Equinoctiall, the height of the Pole is knowen, as the seuenth Chapter doth declare.

How to vse the starres declination to know the height of the Pole.

And now I thinke it conuenient to make certaine Tables, to shew vnto you at what houre and time any of these starres be vpon the Meridian, whereby they may the better know these starres. I will also shew vnto you how long any of these starres do shine or tarrie aboue the Horizon in the Latitude from the Equinoctiall of London, that is at 51 or 52 degrees. And also at what point of the compasse any of these starres do rise or set, which will serue this 100 yeeres, without much errour.

A Table to know the rising and setting of these Starres, by what point of the Compasse, and how many houres they be aboue our Horizon, the Pole being raised 51 or 52 degrees.

THE Whales back riseth East and by South, and vnto the Southwards: and shineth ten houres and better.

The Whales belly (in a maner) as the Whales back.

The Rammes horne riseth East Northeast, and setteth West Northwest: and shineth 15 houres 16 minutes.

The Rammes head riseth East Northeast, and setteth west Northwest: and shineth 16 houres 4 minutes.

The Bulles eye riseth neere the East Northeast, and setteth neere ẏ west Northwest, & shineth 15 houres 2. minutes.

Orions left foote riseth neere the East & by South, and setteth neere the west and by South, and shineth 10. houres and 9. minutes.

Orions left shoulder riseth East & to the Northwards, & setteth west & to the Northwards, & shineth 12 houres 45 min.

The first in Orions girdle doth rise a little to the southwards of the East, and setteth a little to the southwards of the west, and shineth 11 houres 46 minutes.

Orions right shoulder riseth East, and vnto the Northwards, and setteth west and vnto the Northwards, and shineth 13 houres 12 minutes.

The great Dog riseth East southeast, and setteth west southwest, and shineth 9 houres.

The lesser Dog riseth East & vnto ẏ Northwards, & setteth west, & vnto the Northwards, & shineth 13 houres 10 min.

The brightest in Hydra riseth East & vnto the Southward, and setteth west and vnto the southwards, and shineth 11 houres and 7. minutes.

The Lyons neck riseth East northeast, and to the Northwards, and setteth west northwest, and to the Northwards, and shineth 16 houres 16 minutes.

The Lions hart riseth neere the East Northeast, and setteth neere the west northwest, and shineth 14 houres 50 minutes.

The Lions backe riseth neere the northeast and by east, and setteth neere the northwest and by west, & shineth 16 houres 26 minutes.

The Lions taile riseth neere the east northeast, and setteth neere the west northwest, and shineth 15 houres 12 minutes.

The Rauens head riseth neere the east southeast, & setteth neere the west southwest, and shineth 8 houres 12 minutes.

The Rauens wing riseth neere the East southeast, & setteth neere the West Southwest, & shineth 8. houres 50. minutes.

The Virgins spike riseth East & to the southwards, & setteth west & to the southwards, & shineth 11 houres 4 minutes.

Arcturus

Arcturus betweene Bootes thies, riſeth neere the noꝛtheaſt and by eaſt, and ſetteth neere the noꝛthweſt and by Weſt, and ſhineth 16 houres 20 minutes.

The South Ballance riſeth neere the Eaſt ſoutheaſt, & ſetteth neere the weſt ſouthweſt: and ſhineth 9 houres 36 min.

The Noꝛth Ballance riſeth neere the Eaſt and by ſouth, and ſetteth neere the weſt and by ſouth, and ſhineth 10 houres 38 minutes.

The Scoꝛpions heart riſeth neere the Southeaſt and by Eaſt, and ſetteth neere the ſouthweſt and by weſt, and ſhineth 7 houres 5 minutes.

Hercules head riſeth neere the Eaſt Noꝛtheaſt, and ſetteth neere the weſt Noꝛweſt, and ſhineth 14. houres 56. minutes.

The ſerpents head riſeth neere the Eaſt noꝛtheaſt, & ſetteth neere the weſt noꝛthweſt, & ſhineth 14 houres, 40 minutes.

The Eagle riſeth neere the Eaſt and by Noꝛth, & ſetteth neere the weſt & by Noꝛth: & ſhineth 13 houres 24 minutes.

The Dolphins taile riſeth Eaſt and by Noꝛth, and ſetteth Weſt and by Noꝛth, and ſhineth fifteene houres 57 minutes.

The Goates taile riſeth neere the Eaſt Southeaſt, and ſetteth weſt ſouthweſt, and ſhineth 9. houres 20 minutes.

Aquarius leg, riſeth neere the eaſt ſoutheaſt, and ſetteth weſt Southweſt, and ſhineth eight houres 54 minutes.

Pegaſus ſhoulders riſeth neere the Eaſt Noꝛtheaſt, and ſetteth neere the weſt Noꝛthweſt and ſhineth 14 houres 32 minutes.

Pegaſus legge riſeth neere Noꝛtheaſt, and ſetteth neere Noꝛthweſt, and ſhineth 17 houres 6 minutes.

The Whales tayle riſeth Eaſt ſoutheaſt, and ſetteth weſt ſouthweſt, and ſhineth 7 houres 48 minutes.

Furthermoꝛe, if you deſire to know the time of any of theſe ſtarres being about the Hoꝛizon in all Latitudes, then repaire to the 11 Chapter, ſo you ſhall know it there by their declination: euen by the ſame oꝛder that you knowe the Sunnes being aboue the Hoꝛizon, by the Sunnes Declination.

The 11. Chap. will ſhew how long any of theſe ſtars will ſhine in all places.

A Table of the fixed Starres.

	These starres being south frō the first day of January vnto the 15.			Ianua. from the 15. to the last.			Febru. frō the 15. to the 15.			Febru frō the 15. to the last		
1	Whales backe.	5.20	E	1	4.20	DA	1	3.20	DA	1	2.20	DA
2	Whales bellie.	5.54	E	2	4.54	DA	2	3.54	DA	2	2.54	DA
3	Rammes hoyne.	6.28	E	3	5.28	E	3	4.28	DA	3	3.28	DA
4	Rammes head.	6.45	E	4	5.45	E	4	4.45	DA	4	3.45	DA
5	Bulles eye.	8.52	E	5	7.52	E	5	6.52	E	5	5.52	DA
6	Orions left foote.	9.23	E	6	8.23	E	6	7.23	E	6	6.23	E
7	Orions left shoulder.	9.28	E	7	8.28	E	7	7.28	E	7	6.28	E
8	First Orions girdle.	9.50	E	8	8.50	E	8	7.50	E	8	6.50	E
9	Orions right shoulder.	10.12	E	9	9.12	E	9	8.12	E	9	7.12	E
10	Great Dogge.	11.4	E	10	10.4	E	10	9.4	E	10	8.4	E
11	Lesser Dogge.	12.0		11	11.0	E	11	10.0	E	11	9.0	E
12	Brightest in hidra.	12.4	M	12	11.4	E	12	10.4	E	12	9.4	E
13	Lyons necke.	2.12	M	13	1.12	M	13	12.12	M	13	11.12	E
14	Lyons heart.	2.13	M	14	1.13	M	14	12.13	M	14	11.13	E
15	Lyons backe.	3.0	M	15	2.0	M	15	1.0	M	15	12.0	E
16	Lyons tayle.	3.42	M	16	2.42	M	16	1.42	M	16	1.42	M
17	Rauens head.	5.2	M	17	4.2	M	17	3.2	M	17	2.2	M
18	Rauens wing.	5.19	M	18	4.19	M	18	3.19	M	18	2.19	M
19	Virgins spike.	5.51	M	19	4.51	M	19	3.51	M	19	2.51	M
20	Twixt boots thighs.	5.56	M	20	4.56	M	20	3.56	M	20	2.56	M
21	South balance.	7.16	M	21	6.16	M	21	5.16	M	21	4.56	M
22	North balance.	7.33	MD	22	6.33	M	22	5.53	M	22	4.33	M
23	Scorpions heart.	8.54	MD	23	7.54	MD	23	6.54	M	23	5.54	M
24	Hercules head.	9.14	MD	24	8.14	MD	24	7.14	MD	24	6.14	M
25	Serpents head.	9.41	MD	25	8.41	MD	25	7.41	MD	25	6.41	M
26	The Eagle.	12.19	DA	26	11.19	MD	26	10.19	MD	26	9.19	MD
27	Dolphins tayle.	1.12	DA	27	12.12	DA	27	11.12	MD	27	10.12	MD
28	Gotes tayle.	1.48	DA	28	12.48	DA	28	11.48	MD	28	10.48	MD
29	Water pourers leg.	2.48	DA	29	1.48	DA	29	12.48	DA	29	11.48	MD
30	Pegasus shoulder.	3.47	DA	30	2.47	DA	30	1.47	DA	30	12.47	DA
31	Pegasus legge.	4.12	DA	31	3.12	DA	31	2.12	DA	31	1.12	DA
32	Whales tayle.	4.24	DA	32	3.24	DA	32	2.24	DA	32	1.24	DA

March fro the first to the 15.			March fro the 15. to the last.			April from the first to the 15.			April from the 15. to the last.			May from the first to the last.		
1	1.20	DA	1	11.20	DA	1	11.20	MD	1	10.20	MD	1	9.20	MD
2	1.54	DA	2	12.54	DA	2	11.54	MD	2	10.54	MD	2	9.54	MD
3	2.28	DA	3	1.28	DA	3	12.28	DA	3	11.28	DA	3	10.28	MD
4	2.45	DA	4	1.45	DA	4	12.45	DA	4	11.45	DA	4	10.45	MD
5	4.52	DA	5	3.52	DA	5	2.52	DA	5	1.52	DA	5	12.52	DA
6	5.23	DA	6	4.23	DA	6	3.23	DA	6	2.23	DA	6	1.23	DA
7	5.28	DA	7	4.28	DA	7	3.21	DA	7	2.28	DA	7	1.28	DA
8	5.50	DA	8	4.50	DA	8	3.50	DA	8	2.50	DA	8	1.50	DA
9	6.12	E	9	5.12	DA	9	4.12	DA	9	3.12	DA	9	2.12	DA
10	7.4	E	10	6.4	DA	10	5.4	DA	10	4.4	DA	10	3.4	DA
11	8.0	E	11	7.0	E	11	6.0	DA	11	5.0	DA	11	4.0	DA
12	8.4	E	12	7.4	E	12	6.4	DA	12	5.4	DA	12	4.4	DA
13	10.12	E	13	9.12	E	13	8.12	E	13	7.12	DA	13	6.12	DA
14	10.13	E	14	9.13	E	14	8.13	E	14	7.13	DA	14	6.13	DA
15	11.0	E	15	10.0	E	15	9.0	E	15	8.0	E	15	7.0	DA
16	11.42	E	16	10.42	E	16	9.42	E	16	8.42	E	16	7.42	DA
17	1.2	M	17	12.2	M	17	11.2	E	17	10.2	E	17	9.2	E
18	1.19	M	18	12.19	M	18	11.19	E	18	10.19	E	18	9.19	E
19	1.51	M	19	12.51	M	19	11.51	E	19	10.51	E	19	9.51	E
20	1.56	M	20	12.56	M	20	11.56	E	20	10.56	E	20	9.56	E
21	3.16	M	21	2.16	M	21	1.16	M	21	12.16	M	21	11.16	E
22	3.33	M	22	2.23	M	22	1.33	M	22	12.33	M	22	11.33	E
23	4.54	M	23	3.54	M	23	2.54	M	23	1.54	M	23	12.54	M
24	5.14	M	24	4.14	M	24	3.14	M	24	2.14	M	24	1.14	M
25	5.41	M	25	4.41	M	25	3.41	M	25	1.41	M	25	3.41	M
26	8.19	MD	26	7.19	MD	26	6.19	MD	26	5.19	MD	26	4.19	M
27	9.12	MD	27	8.12	MD	27	7.12	MD	27	6.12	MD	27	5.12	MD
28	9.48	MD	28	8.48	MD	28	7.48	MD	28	7.48	MD	28	5.48	MD
29	10.48	MD	29	9.48	MD	29	8.48	MD	29	7.48	MD	29	6.48	MD
30	11.47	MD	30	10.47	MD	30	9.47	MD	30	8.47	MD	30	7.47	MD
31	12.12	DA	31	11.22	MD	31	10.12	MD	31	9.12	MD	31	8.12	MD
32	12.24	DA	32	11.24	MD	32	10.24	MD	32	9.24	MD	32	8.24	MD

A Table of the fixed Starres.

May from the 15. to the last.			Iune from the first to the 15.			Iune from the 15. to the last.			Iuly from the first to the 15.			Iuly from the 15. to the last.		
1	8.20	MD	1	7.20	MD	1	6.20	MD	1	5.20	MD	1	4.20	M
2	8.54	MD	2	7.54	MD	2	6.54	MD	2	5.54	MD	2	4.54	MD
3	9.28	MD	3	8.28	MD	3	7.28	MD	3	6.28	MD	3	5.28	MD
4	9.45	MD	4	8.45	MD	4	7.45	MD	4	6.45	MD	4	5.45	MD
5	11.52	MD	5	10.52	MD	5	9.52	MD	5	8.52	MD	5	7.52	MD
6	12.23	DA	6	11.23	MD	6	10.23	MD	6	9.23	MD	6	8.23	MD
7	12.28	DA	7	11.28	MD	7	10.28	MD	7	9.28	MD	7	8.28	MD
8	12.50	DA	8	11.50	MD	8	10.50	MD	8	9.50	MD	8	8.50	MD
9	1.12	DA	9	12.12	DA	9	11.12	MD	9	10.12	MD	9	9.12	MD
10	2.4	DA	10	1.4	DA	10	12.4	DA	10	11.4	MD	10	10.4	MD
11	3.0	DA	11	2.0	DA	11	1.0	DA	11	12.0		11	11.0	MD
12	3.4	DA	12	2.4	DA	12	1.4	DA	12	12.4	DA	12	11.4	MD
13	5.12	DA	13	4.12	DA	13	3.12	DA	13	2.12	DA	13	1.12	DA
14	5.13	DA	14	4.13	DA	14	3.13	DA	14	2.13	DA	14	1.13	DA
15	6.0	DA	15	5.0	DA	15	4.0	DA	15	3.0	DA	15	2.0	DA
16	6.42	DA	16	5.42	DA	16	4.42	DA	16	3.42	DA	16	2.42	DA
17	8.2	DA	17	7.2	DA	17	6.2	DA	17	5.2	DA	17	4.2	DA
18	8.19	DA	18	7.19	DA	18	6.19	DA	18	5.19	DA	18	4.19	DA
19	8.51	DA	19	7.51	DA	19	6.51	DA	19	5.51	DA	19	4.51	DA
20	8.56	DA	20	7.56	DA	20	6.56	DA	20	5.56	DA	20	4.56	DA
21	10.16	E	21	9.16	DA	21	8.16	DA	21	7.16	DA	21	6.16	DA
22	10.33	E	22	9.33	DA	22	8.33	DA	22	7.33	DA	22	6.33	DA
23	11.54	E	23	10.54	E	23	9.54	DA	23	8.54	DA	23	7.54	DA
24	12.14	M	24	11.14	E	24	10.14	E	24	9.14	DA	24	8.14	E
25	12.41	M	25	11.41	E	25	10.41	E	25	9.41	E	25	8.41	E
26	3.19	M	26	2.19	M	26	1.19	E	26	12.19	E	26	11.19	E
27	4.12	MD	27	3.12	M	27	2.12	M	27	1.12	M	27	12.12	M
28	4.48	MD	28	3.48	M	28	2.48	M	28	2.48	M	28	12.48	M
29	5.48	MD	29	4.48	MD	29	3.48	M	29	2.48	M	29	1.48	M
30	6.47	MD	30	5.41	MD	30	4.47	MD	30	3.47	M	30	2.47	M
31	7.12	MD	31	6.12	MD	31	5.12	MD	31	4.12	MD	31	3.12	M
32	7.24	MD	32	6.24	MD	32	5.24	MD	32	2.24	MD	32	3.24	M

guſt frō the to the 15.			Auguſt frō the 15. to the laſt.			Sept. b. frō the firſt to the 15.			Sept. frō the 15 to the laſt.			Octob. frō the firſt to the laſt.		
3.20	M	1	2.20	M	1	1.20	M	1	12.20	M	1	11.20	M	
3.54	M	2	2.54	M	2	1.54	M	2	12.54	M	2	11.54	M	
4.28	M	3	3.28	M	3	2.28	M	3	1.28	M	3	12.28	M	
3.45	MD	4	3.45	M	4	2.45	M	4	1.45	M	4	12.45	M	
6.52	MD	5	5.52	MD	5	4.52	M	5	3.52	M	5	2.52	M	
7.23	MD	6	6.23	MD	6	5.23	M	6	4.23	M	6	3.23	M	
7.28	MD	7	6.28	MD	7	5.28	M	7	4.28	M	7	3.28	M	
7.50	MD	8	6.50	MD	8	5.50	MD	8	4.50	M	8	3.50	M	
8.12	MD	9	7.12	MD	9	6.12	MD	9	5.12	M	9	4.12	M	
09.4	MD	10	8.4	MD	10	7.4	MD	10	6.4	MD	10	5.4	M	
110.0	MD	11	9.0	MD	11	8.0	MD	11	7.0	MD	11	6.0	M	
210.4	MD	12	9.4	MD	12	8.4	MD	12	7.4	MD	12	6.4	M	
312.12	DA	13	11.12	MD	13	10.12	MD	13	9.12	MD	13	8.12	MD	
412.13	DA	14	11.13	MD	14	10.13	MD	14	9.13	MD	14	8.13	MD	
51.0	DA	15	12.0		15	11.0	MD	15	10.0	MD	15	9.0	MD	
61.42	DA	16	12.42	DA	16	11.42	MD	16	10.42	MD	16	9.42	MD	
72.3	DA	17	2.2	DA	17	1.2	DA	17	12.2	DA	17	11.2	MD	
83.19	DA	18	2.19	DA	18	1.19	DA	18	12.19	DA	18	11.19	MD	
93.51	DA	19	2.51	DA	19	1.51	DA	19	12.51	DA	19	11.51	MD	
03.56	DA	20	2.56	DA	20	1.56	DA	20	12.56	DA	20	11.56	MD	
15.16	DA	21	4.16	DA	21	3.16	DA	21	2.16	DA	21	1.16	DA	
25.33	DA	22	4.33	DA	22	3.33	DA	22	2.33	DA	22	1.33	DA	
36.54	DA	23	5.54	DA	23	4.54	DA	23	3.54	DA	23	2.54	DA	
47.14	DA	24	6.14	DA	24	5.14	DA	24	4.14	DA	24	3.14	DA	
57.41	DA	25	6.41	DA	25	5.41	DA	25	4.41	DA	25	3.41	DA	
612.19	E	26	9.19	E	26	8.19	E	26	7.19	E	26	6.19	E	
711.12	E	27	10.12	E	27	9.12	E	27	8.12	E	27	7.12	E	
811.48	E	28	10.48	E	28	9.48	E	28	8.48	E	28	7.48	E	
910.48	M	29	11.48	E	29	10.48	E	29	9.48	E	29	8.48	E	
101.47	M	30	12.47	E	30	11.47	M	30	10.47	E	30	9.47	E	
112.12	M	31	1.12	M	31	12.12	M	31	11.12	E	31	10.12	E	
122.24	M	32	1.24	M	32	12.24	M	32	11.24	E	32	10.24	E	

A Table of the fixed Starres.

Octo. from the 15. to the last.			Noueb. frō the first to the 15.			Noueb frō the 15. to the last.			Decēb. frō the first to the 15.			Deceber frō the 15. to the last.		
1	10.20	E	1	9.20	E	1	8.20	E	1	7.20	E	1	6.20	E
2	14.54	E	2	9.54	E	2	8.54	E	2	7.54	E	2	6.54	E
3	11.28	E	3	10.28	E	3	9.28	E	3	8.28	E	3	7.28	E
4	11.45	E	4	10.45	E	4	9.45	E	4	8.45	E	4	7.45	E
5	1.52	M	5	12.52	M	5	11.52	E	5	10.52	E	5	9.52	E
6	2.23	M	6	1.23	M	6	12.23	M	6	11.23	E	6	10.23	E
7	2.28	M	7	1.28	M	7	12.28	M	7	11.28	E	7	10.28	E
8	2.50	M	8	1.50	M	8	12.50	M	8	11.50	E	8	10.50	E
9	3.12	M	9	2.12	M	9	1.12	M	9	12.12	M	9	11.12	E
10	4.4	M	10	3.4	M	10	2.4	M	10	1.4	M	10	12.4	M
11	5.0	M	11	4.0	M	11	3.0	M	11	2.0	M	11	1.0	M
12	5.4	M	12	4.4	M	12	3.4	M	12	2.4	M	12	1.4	M
13	7.12	MD	13	6.12	M	13	5.12	M	13	4.12	M	13	2.12	M
14	7.13	MD	14	6.13	M	14	5.13	M	14	4.13	M	14	2.13	M
15	8.0	MD	15	7.0	M	15	6.0	M	15	4.0	M	15	4.0	M
16	8.42	DM	16	7.42	MD	16	6.42	M	16	5.42	M	16	4.42	M
17	10.2	MD	17	9.2	DM	17	8.2	MD	17	7.2	M	17	6.2	M
18	10.19	MD	18	9.19	MD	18	8.19	MD	18	7.19	M	18	6.19	M
19	10.51	MD	19	9.51	MD	19	8.51	MD	19	7.51	MD	19	6.51	M
20	10.56	MD	20	9.56	MD	20	8.56	MD	20	7.56	MD	20	6.56	M
21	12.16	DA	21	11.16	MD	21	10.16	MD	21	9.16	MD	21	8.16	MD
22	12.33	DA	22	11.33	MD	22	10.33	MD	22	9.33	MD	22	8.33	MD
23	1.54	DA	23	12.54	DA	23	11.54	MD	23	10.54	MD	23	9.54	MD
24	2.14	DA	24	1.14	DA	24	12.14	DA	24	11.14	MD	24	10.14	MD
25	2.41	DA	25	1.41	DA	25	12.41	DA	25	11.41	MD	25	10.41	MD
26	5.19	DA	26	4.19	DA	26	3.19	DA	26	2.19	DA	26	1.19	DA
27	6.12	E	27	5.12	E	27	4.12	E	27	3.12	DA	27	2.12	DA
28	6.48	E	28	5.48	E	28	4.48	E	28	3.48	DA	28	2.48	DA
29	7.48	E	29	6.48	E	29	5.48	E	29	4.48	E	29	3.48	DA
30	8.47	E	30	7.47	E	30	6.47	E	30	5.47	E	30	4.47	E
31	9.12	E	31	8.12	E	31	7.12	E	31	6.12	E	31	5.12	E
32	9.24	E	32	8.24	E	32	7.24	E	32	6.24	E	32	5.24	E

NOw this Table serueth for euery moneth in the yeere (being exactly calculated) the time of their being south, or touching your Meridian (or as some terme it) Noonestead, seruing very well the Sea-men to take the height of them with their instruments vpon the Sea, referring it vnto the Table of declination that goeth before: the first is the houres, the second the minutes, the third be the letters that shew you whether they be south by day or by night, in the euening or morning, in the forenoone or afternoone, of which the letter E doth signifie Euening, the letter M signifieth Morning, the letters DM signifieth day in the morning, and the letters DA signifieth day in the afternoone (as I said before) the very houre and minute of their being South. Now you see that I haue put to their being South in the day, as well as in the night, to the intent to know the houre of the night as well by their setting, as also by your compasse, which I shewed you in the first chapter or rule, namely to bring your 32 points, into 24 houres: and in like manner, in the fourth chapter by shining of the Moone to diuide the shining into equall parts, then those parts being equally diuided with the houre and minutes, the time of their shining before their being South, sheweth the iust rising of the starres, and the other time of their shining after their being South sheweth their setting (as I haue declared in the rule of the shining of the Moone.) Now (seeing the Table runneth from the first day of euery moneth to the 15. From the 15 to the last day,) if you will know the exact time betweene the first day or the 15 day, and betwixt the 15 day, and the last, doe this, looke how many dayes of the moneth is past, either from the first day or 15 day, and pull so manie times foure minutes from that number as there are dayes past, either from the first or 15 daye, the remainder will shew you the true time of their being South. That knowen, you shall doe (as is afore said) for their rising and setting.

The signification of the letters in the Table.

The 21. Chapter sheweth you the making of a generall instrument, to know the houre of the day by, throughout all the world.

NOw for the making of your Instruments for the Sea, with their vses, you shall repaire to the booke of Nauigation made by Martin Curtise a Spaniard, imprinted by M. Iugge, late Printer to the Queenes Maiestie: Else I would haue shewed you the making of diuers instruments, as also the making of the Equinoctiall Diall with his vse, which is very profitable to know the houre of the day by, in all Latitudes through the whole world, for your Compasse is not to know the houre of the day by the summer, neither in the morning nor Euening, neither can you know when the Moone is East or West, she hauing North declination, as being in the signe of Taurus, Gemini, Cancer, or Leo, because your Compasse standeth flat as doth your Horizon. Wherefore it is very good for sea-men to vse the equinoctiall Dialls, for that it sheweth them the true houre of the day in all Latitudes, and also the Moone doth giue a true shadow in that Diall in all Latitudes, for I doe know that Sea-men are very many times deceiued where it doth flow an East and West Moone, or any Point betweene the Southeast and Northeast. Because in setting the Moone with their compasse (being in the North signes,) she seemeth to be East by the compasse, when she is neere the East Southeast in her course: and in like manner when the Moone seemeth west by the compasse, she shall be a little more than west South-west in her course: which is a very perilous matter vnto them that should put into a tide, harborow, or hauen, where he knoweth there is water inough for him, if that he doth come at a full sea, and then by the error, of the Moones shadow vpō the Compasse he is deceiued: and when he findeth the error, he thinketh that the cause thereof commeth by the occasion of some storme of wind that is like to folow, imputing it thereto, that the tide doth not keepe his course, whereas the very cause

The Sunne & Moone do giue a full shadow by the compasse.

The Equinoctiall diall giueth a true shadow all the world ouer.

A perillous matter.

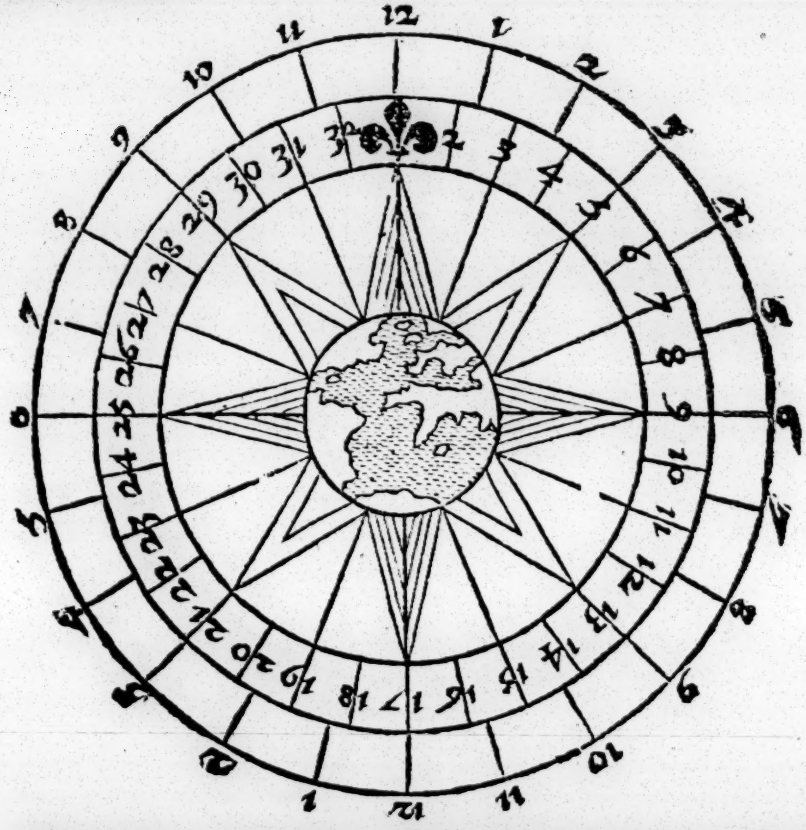
cause groweth by no other meanes then by receiuing a false shadow by the Horizontal compasse: which falleth out especially if the Moone be neere her greatest declination vnto the North parts, that is in the signe of Geminie & Cancer. And also the effect is most perceaued if the dragons head be in the beginning of the signe of Aries: for then if the Moone be in the beginning of Cancer, she shall haue 5. degrees more in declination from the equinoctiall then the sun shall haue at his greatest declination vnto the North parts. So that reserving the Moones paraler, (which is according vnto the latitude of any place) the Moone shal be declined 28. degrees and a halfe vnto the north part of the Equinoctiall: so that for auoiding of these inconueniences, I would wish them to vse the Equinoctiall dials. And furthermore, I do thinke that the Equinoctiall dials be not vsed amongst our Mariners heere in England, for that the charges is so much in the making of them, and yet it serueth no other turne but to know the houre of the day, and to shew the true shadow of the Moone. I haue not knowen them vsed by any English master or Pilot, but only by one man, which person had not it for the proper vse thereof, but rather had it to say, that he had such an instrumēt as no English man had the like, and to brag that he had such an instrument, that he could do great feats therwith in going of long voiages. &c. I would haue no man offended with me. I know the nature & qualitie of some that take charge, they will haue instruments and other things thereunto appertaining, and yet they themselues do not know the vse of them, yet they will seeme to be cunning, and that they neede no instructions of any man, for that they know all things, and yet in respect know nothing. (But notwithstanding) I would wish them that be seafaring men, to vse themselues to the Equinoctiall dials, for that they do serue two notable turnes, as well at home in these our channels, as also in long voiages, they make them with a very easie charge: for whereas in the Art of Nauigation it is shewed how to make them in brasse, they make them with wood in this manner, take a peece of

The Moone may decline 28. degrees and a halfe from the Equinoctiall.

Of men that will haue instruments and know not the vse of them.

An easie way to make an Equinoctiall dial with little charge.

boords end of sixe inches broad more or lesse at your discretion, and halfe an inch in thicknesse, then hauing cut it round and plained it smooth, you may either graue in it the 32 points of the Compasse, or else paint them vpon it, with some coulours, with the 24 houres, vpon both the sides as this figure sheweth.

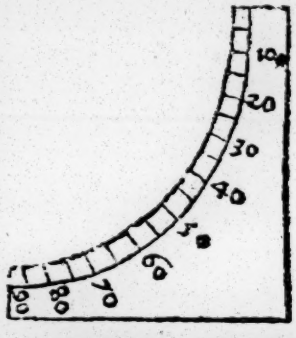


That done, take a wyer of iust the Diameter of the Instrument, then put it through the midle or Center of the Instrument, then make it fast, that the one ende be halfe way through on the one side, and the other halfe on the other side: this done, make a frame with three peeces of boords ende, to hang the Diall or instrument vpon, with one pin on the East point, and an other on the west point: then take an other peece of boords ende being square, and with a paire of compasses strike a quarter of a circle, of iust the bignesse of the quarter of the Diall, and cut all that away, and then the rest

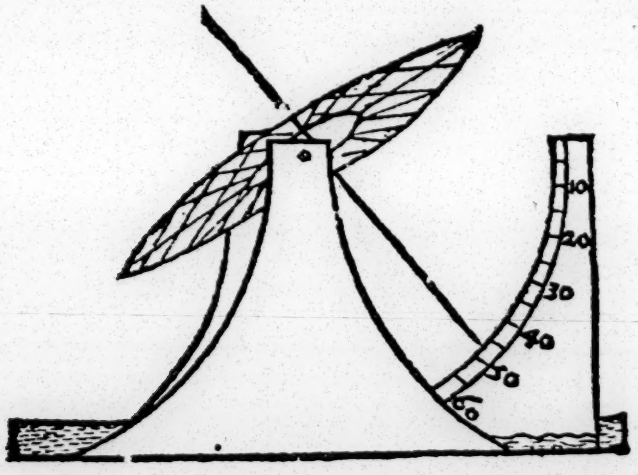
of

of the ſquare that is left (at the edge of the quarter of the circle) deuide into 90 equall parts, marking it thus, 10. 20. 30. 40. 50. 60. 70. 80. 90.

As in this foꝛme: laſt of all, let this be placed in the middle of the frame, ſo that 90 may ſtand right vnder the very middle of the Diall, and there made faſt, in ſuch foꝛme, that the very end of the wier when the Diall is put vp and downe may touch the hollow part that you ſee cut away, which is called the Directer, and ſo it is finiſhed, and will ſtand altogether in this foꝛme.



The Equinoctiall Diall.



The vſe of this Diall is moſt neceſſarie in a Ship, foꝛ that you haue occaſions to tranſpoꝛt your ſelues into all the climates. And to know the true houre of the day, doe this: Set this Diall by your compaſſe, (the directer vnto the Southwards) and then (you knowing how high the Pole is aboue the Hoꝛizon) ſet the end of the wyꝛe right againſt that degree, in the directer, and the other end of the wire wil point iuſt vnto the Pole, then looke what ſhadow the wire doth giue

by

by the Sunne, that is the true houre of the day. In like manner you may know the true houre of the night by the Moones shadow, and also the Moone will giue a true shadow of her place, &c.

The 22. Chapter treateth of the soundings, comming from any place out of the Occident Sea, to seeke Vshant or the Lyzard, and so all alongst, till you come to the coast of Flanders: with other necessary matters to be knowen to them that be Channellers, that doth occupy or deale amongst sands, banks, or such other like.

BEcause it is necessarie to be had in memory, for that it is a daungerous place to hit or fall with, to enter into the sleeue, comming homewards out of Spaine or Portugall, or from Barbarie, or any other place from the Southwards, a Ship that commeth from any such place to seeke the Isle of Vshant, or the Lyzard, in this roote of sounding of a 100 or nintie fadames shall finde big soundings, and shall be neere about to the seames. In the roote of eightie fadames you shal finde cockle shels and dents in the tallow of the lead: and in this sounding hold on your course to the North, till you change sounding, then if you be at 60 or 64 fadame, you shall finde small sand and Mathey ground, and shall be neere the coast of Vshant. If you haue time and day, goe seeke it in the Northeast, & you shall be about 10 leagues frō ẏ Isle. If you come making your course about Base freed, you shall finde course sand, red & browne, & you shall haue sounding at 40 fadame: if you be towards the banke of Silley, you shall haue soundings, at 86 or 90 fadame, and you shall finde in the tallow stonie ground, and shall be well shot towards the banke of Silley. When you be at eightie fadame, you shall finde small black sand, and shall be well towards the Lizard. When you be at sixtie or 64 fadame, you shall finde white sand, and white soft worms, and shall be very nigh to the Lizard. Betweene the Cape of Cornewall and Vshant and the

The sounding neere vnto Vshant & the Lizard.

the channell you shall finde 17. fadame and neere inough. Betweene Dodmon and the Foyne, in the channell you shall haue 40. or 50. fadame. If you be thwart of Plimmouth or the Start, you shall finde streamie ground and dents in the tallow and soundings 41. or 42. fadames. At the comming from Portland you shall haue 35. fadames, & small shingles. And when you be nigh to Portland 30. fadames, and stones like beanes, and this sounding wil last till Saint Aldam, and in the said sounding you shall finde white stones like broken Aules, and other that be bigger, and then you shall be thwart of Saint Aldam or of the Ile of Wight.

Two or three leagues from the Ile of Wight, you shall finde 25. fadame, with dentes and clefts in the tallowe like small threds, two or three leagues from the Caskes, you shall finde 40. fadame, and bigge stones ragged and blacke. Betweene the Ile of Wight and the Hag, the deepest is but 35 or 40. fadame. Betweene the Ile of Wight and Lantargat, the deepest is but 25. or 30. fadame. Betweene Beachy and the Ile of Wight a league from the land, you shall finde 38. fadame, and Poppel as bigge as Beanes, Betwene Fairely & the water of Summe in the deepest, but 25. fadam. Betweene Folkstone and Bolaene, is a banke that is called Rippe, rappe & lieth in the midway betweene Picardie and England, and hard a boord by it, is 26. or 27. fadame. In the straight of Calyce is 30. fadame, in the Rode of Calyce is 16. fadame. And alongst the coast of Flaunders is but 20. fadame, the deepest. Thus much haue I said for the entrance of the Sleeue, to come to the Riuer of Thames, and in the enterance in the midway betweene Ushant, and Lizard, the Pole Arcticke is eleuated 50. degrees and a halfe, and the Equinoctiall is lifted aboue the Horizon 39. degrees and a halfe. And furthermore, for them that are Chanellers and occupiers amongest sands and bankes, & such other like, they must haue consideration of these things following. As this: (first if you know how the Channell doth lie right betweene any two sands: you must view the land to take some markes of

The sounding in the channel.

The height of the Pole at the enterance of the sleeue.

Necessarie things to be noted for the that are Channellers and dealers amongst sands.

of it, to be a leading marke. And that you shall do thus: looke some thing that standeth farre into the lande, that you may know it wel, being right open with the Channel of the sands, then take an other marke neere vnto the waters side, and the one to be right against the other, when that you be in the middle of the Channell: And then you knowing these two markes well, they will be leading markes vnto you for euer to keepe that Channell.

And then furthermore, if it doth so happen that the Channell doth turne to keepe another course or else (some other dunger lying in ẏ way) you must haue a thwart mark, to know both when that you are cleere of any daunger, and also when that you are open of an other Channell, and that you shall do as before is declared, to take some marke within the land, and also an other neere vnto the sea, water, or riuers side to be your thwart marke when you bring them both together. And this is most specially to be noted: that these markes be verie yare, and good when the one is farre distant from the other: and those markes very slow and asketh some distance in sayling to open and shut them which are neere together vpon the land. And furthermore, for them that are Channellers or occupiers amongest sandes, for that the weather is not alwaies cleere, when they haue occasion to passe through such places, it is good for them to sound the Channels perfectly, and to know by the depth, what side of the Channell they are vpon, & also how farre they are shut into that Channell. And also in like manner, to know by the sounding of any of the sides of the Channell, whether they be neere any of the sandes or daungers, or any breach off: for that some sandes or daungers there be, hauing fayre or good soundings or shaldings, that they may borrow off and on their pleasure. There be againe some sandes or daungers, that there is no borrowing nor sounding of them, and those be neall or deepe hard vnto the sandes or daungers: for that the water is deepe hard vnto the sand: and these are verie daungerous sandes for any shippe to come neere, for that they shall haue

the

the water verie deepe, and by and by be a ground. Yet furthermore, it is very good for them that be Channellers and occupiers amongst sandes, to know which way the tide doth set at euery time of the tide: for that many times it happeneth so, that when the sandes be vnder the water, the tide doth set crosse the Channel, which is a daungerous matter if it be not verie well considered by the Maister or Pilot, &c.

The twentie three Chapter is as touching the variation of the Compasse, called the Northeasting and the Northwesting of the Compasse: and how to giue a guesse to knowe the Longitude.

AS touching the variation of the Compasse called the Northeasting or Northwesting, it is supposed that the Compasse doth varie by proportion, in the sayling to the Eastwardes or Westwardes: if it varieth by proportion, that the Northy point is varied one poynt from the North, at 22. degrees and a halfe, and so vntill the Northy point doth stande Northeast or Northwest. And that is, when you are 90. degrees from the Meridian that the Compasse was made at, to the Eastwardes or Westwardes. Some also are of an other opinion, that the Compasse doth varie by no proportion, but doth varie according vnto the nature of some kinde of Mineralles, that is in some countrye, or some kinde of Ilandes, that drawe the Compasse by the mines of the Loadestone, or Magnes stone, that they touch their Compasse with when they make them. And furthermore, the booke of Martin Curtise, called the Arte of Nauigation sayeth that the Compasse doth vary by proportion in this manner: which is by the proportion of a Circle, for that the Northy point doth alwaies point vnto a place in the heauens that is vnmooueable,

Of the Compasse to vary to euen proportion.

Of the Compasse to vary by no proportion.

Of the Compasse to varie according vnto the proportion of a circle that is swiftly, and slowly.

and therefore as you doe transport your selfe to the Eastward or Westward, the North point, doth stil point vnto that place in the heauen: wherefore (as he saith) when you be 90 degrees in Longitude from the place that the compasse doth stand due South and North, that is, when you be one quarter of the circumference of the earth, in that Paralell the Compasse will be varied foure points from the North: and as you do transport your self further, then the North point of the compasse wil come nerer & nearer into the north: and whē you are iust halfe the circumference of the earth, that then the North point will stand due North vpon the Pole againe, for that you are come to the same Meridian againe vpon the opposite part of the earth (as it doth appeare in the third part, and fifth Chapter of the said booke of Martin Curtise) but if that be true, then the compasse doth vary swiftly at the first, and slowly afterwards, in order like vnto the Sunnes declination: by which they may verie well know by what order the Compasse doth varie, and so by the variation you may giue a neere estimation of the Longitude, and know in howe many degrees the Compasse is varied one point, two pointes, three points, or foure points, which is the greatest variation. Now to know the proportion, doe this: First make a circle with a payre of compasses, and strike a line by the Center to the circumference, which shall be your Meridian line, then strike an other line by the Center a crosse, that you may deuide the circle into foure equall parts, and then because 45. degrees is the greatest variation, set 45. vnto the East part and West part, deuiding euery one of the quarters of the circle into 45. equall parts, according to the greatest variation: then make an other circle of that Diameter, that the circumference touch that Center of the circle, and deuide it as you deuided the compasse, after the rate of 32. points, although you need not to deuide but that side to the Northwardes, and then the Northeast & Northwest point will fall vpon 45. degrees: that done, draw lines according to the pointes of the compasse vnto the Eastwards or Westwards, and looke how they

To know in how many degrees going vnto the Eastward or Westward, that the compasse doth vary one point two points, or three points. &c.

they fall vpon the line that commeth from the Center of the other circle: of which euerie quarter is deuided into 45. equall partes, and then (at the verie place that the line doth touch) draw Paralell lines in the circle by proportion at euery place to the Eastwards or Westwards, that the line of the compasse falleth vpon: and that wil shewe you iustly howe many degrees you shall transport your selfe vnto the Eastwards or Westwards for the varying of the first point, second point, and third point: and in like manner the greatest variation which is the fourth point. So that (according to that order) it will fall out in this manner, that the compasse will be varied one point at neere eleauen and ½. It will be varied two pointes neere about 24. degrees and a halfe.

To know how many degrees is, in the varying of one point.

It will be varied three points at 42. degrees and about a halfe. But it will not be varied the fourth point vntill you be 90. degrees from the Meridian that the cõpasse was made at: which is a very slow varying being 47. degrees & ½ before the compasse doth varie one point, & betwene the third point & the second point, being 18. degrees for the varying of that point, and then from the second point vnto the first point is 13. degrees and better, and last of all from the varying of one point to the Meridian it is eleauen degrees and ½ part, euery degree being according to that Paralell you are in, which doth alter according vnto your Latitude from the Equinoctiall, for vnder the Equinoctial it is 60. English miles or 20. English leagues vnto one degree. In the Latitude of 60. degrees from the Equinoctial, there in that paralel it is but 30. miles, or 10. English leagues vnto one degree, &c. As it is plainly shewed in the 16. Chapter of this booke, wherein is an instrument shewing you how many miles of Longitude will answere vnto a degree in euery seuerall Latitude by the applying of a thread at your discretion: So that I conclude, If the compasse doth varie by that order of proportion that Martin Curtise doth attribute vnto it, you may giue an nere guesse to finde the Longitude by the varying of the compasse, being neere vnto the Meridian in which the compasse doth stande

If you will know how many leagues a degree is, repaire to the 16 Chapter.

and th outh and Noꝛth: but if you be very farre from the Meridian that the compaſſe was made foꝛ, then the variation is ſo ſlow, that you can haue no iudgement at all (by the variation of the compaſſe) to finde any Longitude.

There may grow ſome error in the proportion of the varying of the Compaſſe.

And furthermoꝛe, if the compaſſe doth vary by that pꝛopoꝛtion that Martin Curtiſe doth affirme, I am of that opinion, that there may grow ſome errour in pꝛopoꝛtion in thoſe compaſſes that are made foꝛ any Meridian: foꝛ thoſe compaſſes that are made heere with vs in England, whereof the needle doth ſtand foure oꝛ fiue degrees vnto the Eaſtwards of the Noꝛth, (as doth appeare by all the needles made foꝛ Dials, and alſo of the compaſſes) if they would haue the Noꝛth point to ſtand due Noꝛth, then the ende of the wyers vnder the Carde of the compaſſe ſhould ſtand foure oꝛ fiue degrees vnto the Eaſtwardes of the Flouredeluce: wheꝛefoꝛe it may be doubted, that the compaſſe may varie moꝛe the one way then it will the other way, by that pꝛopoꝛtion that the ende of the wyer doth ſtand from the Noꝛth point. Foꝛ (if in the greateſt variation) the ende of the wyer (vnder the Carde of the Compaſſe) doth ſtand Noꝛthweſt, the Flouredeluce of the Compaſſe ſhould ſtand neere halfe a point to the Weſtwards of the Noꝛthweſt.

And in like manner at the greateſt variation, if the ende of the wyer doth ſtand Noꝛtheaſt, then the Flouredeluce ſhould ſtand neere halfe a point vnto the Noꝛthwards of the Noꝛtheaſt, &c. Wheꝛefoꝛe the compaſſes that were deuiſed by Norman, are verie good to refoꝛme thoſe cauſes. But this cauſe is very ſpeciall, to giue a neere gueſſe of the Longitude, that is to ſay, the compaſſe will varie moꝛe quickly (accoꝛding to the oꝛder befoꝛe witten,) by which you ſee they may tranſpoꝛt themſelues further into the Eaſtwards oꝛ Weſtwardes, befoꝛe that the compaſſe doth varie one point, then it doth foꝛ the other three points, ſo that they are not able to giue any eſtimation at all, by the varying of the compaſſe to know any Longitude: foꝛ that they may trauaile moꝛe then the quarter of the circumference of the earth, befoꝛe the com-

Of ſlow varying of the Compaſſe.

paſſe

passe will be varied one point backwerds and forwards.

And furthermore, it is very good for them that are Masters or Pilots of shippes, to note, when they do fall with any land where the compasse is varied, to make a remembrance in a booke, how many points and degrees the compasse is varied in euery place where they came vnto, which will be a great helpe for them to finde that place againe. And to finde the variation, it is declared in the sixt Chapter. Of making notes of the variation.

A Hydrographical discourse to shew the passage vnto Cattay fiue manner of waies, two of them knowen and the other three supposed, wherein you shall know the distance of Cattay, and also by what points or winds of the compasse that you shall saile for the atttaining thither, and also the rest of the East Indies.

Whereas it hath beene oftentimes in question of late yeeres now in this our age, for the discouerie for to finde out a way to come vnto Cattay, China, and the Ilands of Moluccas: with other places in the East Indies. I haue thought it good to write this Hydrographicall discourse, to go to Cattay fiue manner of waies, for that there are some people that are doubtfull whether that there be any such place, other some are doubtful that there is no passage thither.

So some holding one opinion and some another, I haue taken vpon mee for to shewe vnto them the passage to goe vnto Cattay fiue manner of waies, wherof two of them are knowen, and the other three supposed.

Wherein I haue set downe perticularly the courses, that is to say, by what point of the compasse that you must saile, and also the distance what number of leagues that it is from place to place, hauing perused the best Cosmographers, and for that wee haue no Charts, Plats, Hydrographicall that

and th oth shew the true courses and distance, it is possible that is not̃ exactly true, but onely to glaunce somewhat neere the matter: Therefore you must not looke to haue it so certaine that there is no errour in it, neither am I assured that it is not altogether vntrue, either in the distance or courses, but that you may haue some aide by this, &c.

To goe vnto Cattay that way that the Portugals, doe goe vnto Calicut and the Ilands of Moluccas, which is about by Cape bone Sperance, after that thou art departed from the Lizard or Cape of Cornewall, being the Westerne part of England, you must make your direction from thence vnto the Canarie Ilands, hauing Latitude twentie eight & halfe, the course is nere the south southwest about fiue hundred leagues.

And on the starre boorde side is the West Ocean sea, and on the Larboorde side, first the coast of Fraunce, then the coast af Spayne and Portugall, and then coast of Barbarie in Africa, &c.

From the Canarie Ilandes you must set your course vnto Cape de verde in Ginney, the Latitude thereof is neere 15. degrees, and the course is South about 270. leagues, and on the starboord side is the West Ocean Sea, and on the Larboord side the coast of Barbarie and Ginney from Cape de verde you must goe vnto Cape Palmas, the Latitude is neere foure degrees, and the course is South and by East, about 130. leagues, and on the Starboord side is an Ocean sea, and the Larboord side, the coast Ginney. And from thence make your direction to Cape bone Sperance, being the southermost part of all Aethiopia, forsaking the coast, and making your course through the sea, the course is neere the South-east and by South, 1060. leagues, and the Altitude of the Antarticke Pole, is about 35. degrees aboue the Horizon, and on the Starboord side is Brasile in America, and the great Riuer of Platte, and on the Larboord side is the coast of Castill de Mine, in Ginney and Binney, and the coast of Aethiopia, &c. But if that you will keepe the coast of Ginney, then being departed from Cape Palmas, goe vnto the Ilande of

Saint

Saint Thomas, your course is East and by South, neere fiue hundreth sixtie leagues, and the Iland of saint Thomas hath no Latitude, for that it is directlie vnder the Equinoctiall, and on the starboord side is the Ocean Sea, and on the larboord side is the Coast of Castell de Mine, and the Coast of Binnie. &c.

And from the Iland of Saint Thomas, vnto Cape bone Sperance, the course is South and by East, about seauen hundreth fifty leagues, and on the starboord side is the Ocean sea, and on the larboord side the coast of Aethiopia: from Cape bone Sperance, you must set sayle vnto the great Iland of saint Laurence, namely to the Westermost part of the Iland, and that hath Latitude toward the Antarticke Pole, aboue 28 degrees, and the course is from Cape bone Sperance, Northeast and by East, about 550 leagues, on the starboord side, is the vnknowen land that lyeth towards ỹ Antarcticke pole, and on the larboord side the Coast of Aethiopia, and the length of the Iland is about 360. or 400 leagues, and the longest way of the Iland doth lye East Northeast, and West Southwest, and is from the mayne land of Aethiopia about eightie or 100 leagues. &c. Furthermore by the way, I doe thinke it good for to shew the course and distance vnto the red sea, and also the course and distance vnto Calicut. To set out your course from the Eastermost end of the great Iland of saint Laurence, which hath the Antarticke Pole raised 13 degrees, towards the straights of the red sea, the course is North and by East about 470 leagues, and the latitude of the straights, is about 10 degrees, towards the North Pole, and this straights is greatly occupyed, for that all the Spices that serueth the Turkes dominions, and also some parts of Christendome, is brought from the Iland of Moluccas and other parts of the East Indies, as Calicut, and such like places, and so by shipping transported into the red sea, and so put on land in Aegipt and carryed ouer a little part of the land, and then they are newly embarked, and brought downe to the great Riuer Nilus, and put a land at Alexandria in

Aegipt, that is a Port, in the midland sea, and from thence they are transported by shipping vnto a number of places both in the Turkes dominions, & other places Christened, &c.

From the straights vnto the hether ende of the red sea in Aegipt, the course is for the most part Northwest and Northnorthwest, about neere 500. leagues. And going into the read sea, the starboord side is the coast of Arabia, and the larboord side is first the coast of Aethiopia, and then the coast of Aegipt, &c.

And also if that you will goe from the East end of the great Iland of Saint Laurence, vnto the famous merchaunt towne called Calicut in Indie, then your course is Northeast and to the Eastwards about 860 leagues, and the latitude is fiue degrees to the North parts, and on the starboord side is the Ocean sea, and the Larboord side is the coast of Aethiopia, and the straights of the read sea, and the coast of Arabia, and the straights of the Persians sea, and the Iland of Ormes, &c. But if that you will hold on your course to go vnto Cattay, then from the east end of the great Iland of Saint Laurence, to the great Iland called Traprobane, your course is East Northeast, or East & by North about 1100. leagues, but it is possible, that in these courses, you may meete with a number of Ilands, for that all this East Ocean sea is very full of great and small Ilands, and the midle of this great Iland lyeth directly vnder the Equinoctiall, and the length of this Iland is neere 300 leagues, and on the starboord side is the vnknowne lands, towards the Antarcticke Pole, and on the Larboord side the straights of the redde Sea, Arabia, the Iland of Ormes, the Persian sea, Calicut, and the great riuer of Ganges. And now for to depart from the great Iland of Traprobane, to goe vnto the great Iland of Gilolo, being the greatest Iland amongst all the Moluccas, the course is East about one thousand leagues, but there lyeth a number of Ilands in the way, and on the starboord side is the Iland of Iaua and Borneo, and on the Larboord side, the greatest heape of the Moluccas Ilands. The Iland of Gilolo

hath

hath no latitude, for that it lyeth directly vnder the Equinoctiall from the Iland of Gilolo vnto the coast of China, the Course is North and by West, about 500. Leagues.

The latitude of China is about 25. degrees, and on the starboord side is the south sea, and America, and the larboord side is the Ilands of Moluccas: but for to goe from the great Iland of Traprobane, the next way to China, the course is Northeast and by East 1000. leagues, and then on the starboord side, you shall haue all the Moluccas Ilands, and on the larboord side the maine land of Asia or East India, and then from the Coast of China, vnto the great Bay of Quinsay in Cattay, the course is North and by East about 100. leagues, and the entraunce of the Bay of Quinsay, the Latitude is 35. Degrees, and on the starboord side is the firme land of America, and the great Iland of Iupan, and the larboord side the coast of China and Cattay. &c.

Now thus much haue I sayd as touching the way to come out of England to goe vnto Cattay, and East India, hoping that the reasonable Reader will not enuie me, for this vsing my discourse, neither you must not looke so exquisitely vnto it, for that it cannot be the exact truth: for as I do suppose that no English man hath seene any true Chart or Plat of all the East India, wherefore I doe suppose that you will beare with this my discourse. &c.

And now furthermore as touching this discourse for to come out of England to goe vnto Cattay, the second way, and that is knowen that the sea will let them haue passage, that is to say, through the straights of Magellane, and so into the south sea, as this, first to make theyr direction from the west part of England vnto the straights of Magellane, although that in deede there can be no long passage by Sea, but that the ships are to seeke some places for to water at, & other easements, yet notwithstanding I do meane to make but one direction or course from England vnto the straights of Magellane, for that the Maisters or the Pilots may seeke their watring places most best for their purposes. &c.

From the Lizard vnto the straights of Magellane, the course is for the most part south southwest and to the westwards, about 2400 leagues, and the Latitude of the straights is 52. degrees and a halfe towards the Antarctike Pole, and on the starboord side is the firme land of America, and the larboord side Europe and Africa. &c.

And through the straights, the course may be West or West southwest one hundreth or 140 leagues before that they be cleerely in the south sea, and now being into that sea, they may go either into Cattay or the Moluccas, or the Port of Pannama, that is the place where the King of Spaine hath all the treasure that commeth from Peru. And from thence it is caried vp a certaine riuer, and transported ouer the necke of a land, and then imbarked and brought downe an other Riuer, and so landed at Nombre di dios, and from thence transported by Ships into Spaine, &c.

Being through the straights of Magellane, if that you will goe into the Port of Pannama, then your course is for to go Northnorwest, or norwest, and by North, or North and by west, as the land will giue them passage, for that there hath not beene made any true Plats for that Coast in that sea, and doth containe in leagues from the straights vnto the port of Pannama, one thousand one hundreth or 1200 leagues. But if that you will go from the straights vnto Cattay, as it is a Sea that is not vnto the South parts neere the straights well knowen, so there may lye many Ilands in that Sea that you may meete with, and also there may be rockes and daungers there in like manner that are not knowen, but the generall course is Norwest vnto Cattay or China, about 2800 leagues, hauing on the starboord side the maine land of America, and on the larboord side the vnknowne land that lyeth towards the Antarcticke Pole, and also the Ilands of Moluccas, and Calicut, and thus much haue I sayd as touching the passage vnto Cattay, by these two wayes that are knowen. But heere is one thing to be noted, for (as it hath beene reported) the Portugalls Carickes going vnto Calicut, when

that

that they be at Cape bone Sperance, then they do not directly set their course the nert way, but stand South ouer towards the land that lyeth to the Antarctike Polewards, and the cause thereof is the great Current, that is at Cape bone Sperance, continually running from the East into the West, and when that they haue gone a hundreth or a hundreth and fiftie leagues vnto the southwards of the Cape, then they set their Course for to go with Calicut, so that outwards they do not come neere the great Iland of Saint Laurence, but goe a great deale to the southward of it, for that they will not be let by the great currant: But when that they do come homewards, then they do come hard by the Ile of Saint Laurence, and so directly with Cape bone Sperance, for that they will haue all the help that they may with the Current, then they goe west Northwest into the sea with the maine land of America, till that they be halfe that sea ouer, and then they do set their course to goe homewards, as it is not vnknowen, that when the Spanish Fleete doth goe outwards to the West Indies they do go vnto the Canaries, and so west into the sea, and so hold in by the south land of the Bay of Mexico, for that they haue some help by the Current: but when that they do come home, then they do come by the north land of the Bay of Mexico, betweene the Iland of Cuba and Terra Florida, for that they will haue the Current homewards to help them. Also it is reported that in the straights of Magellane that the Current runneth continually from the East into the West. Now thus much haue I sayd, as touching the two wayes vnto Cattay, for that it is knowen that there is passage by Sea, if that it were attempted, although the passage is very long. &c.

The third way, that is not knowen, but supposed that it may be passageable, is by the Northwest, the which of late Captaine Forbisher hath begun to enter into, and hath discouered it as farre as a place now called Meta Incognita, which he himselfe did call Forbishers Straights, but yet notwithstanding it is doubtfull, whether that be a straight to giue pas-

ſage to come into the Eaſt Ocean ſea, or ſouth ſea, for any thing that is knowen yet, it may be as well a Bay as otherwiſe, but notwithſtanding whether that be a ſtraight or not, it is poſſible that there may be paſſage there about, betweene the Norther part of America, as betweene Labradore and Gronland, and ſuch lands as lye toward the North Pole.

Wherefore now for to depart from England to go vnto Cattay by the Norweſt, firſt in making your direction from the Weſt part of England, vnto the place called Meta Incognita, the courſe is Weſt Norweſt about fiue hundreth fifty leagues, and the latitude thereof ſixtie three degrees, and on the Starboord is firſt Ireland and Iſeland, and Freeſeland, and on the Larboord ſide, is the Ocean ſea. Being at Meta Incognita, you muſt diſcouer there abouts, where that you may finde ſea for to giue you paſſage, and yet if you do finde ſea, you muſt hold on your courſe Weſt vntill that you haue paſſed one thouſand, or one thouſand one hundreth leagues. For if that you ſhould hold on any ſoutherly courſe, you ſhould imbay your ſelfe in the maine land of America, for the extention of the backe ſide, or North ſide of America, is not much leſſe then one thouſand leagues, before that you ſhall open the way into the Eaſt Ocean ſea, and in this weſt courſe on the ſtarboord ſide is the North Pole, and ſuch lands as lyeth that way if there be any, on the Larboord ſide, is ẏ maine of America, &c. And after that you haue ſailed Weſt one thouſand leagues on the North part of America, you may then direct a more ſoutherly courſe, becauſe then you may be open of the Eaſt Ocean ſea, for the moſt part of the beſt Coſmographers lay ẏ opening of that Sea oppoſite vnto vs in our Meridian, and then holding on a ſoutherly courſe, you may hale vnto the great Baye of Quinſay about foure hundreth or fiue hundreth leagues. And the latitude of the north part of the Bay of Quinſay in Cattay is about fortie fiue Degrees, and on the ſtarboord ſide is the coaſt of Aſia, as Mangie and Cattay, and on the Larboord ſide America. And thus much haue I ſaid as touching the third way to goe to Cattay, &c.

The

The fourth way to go vnto Cattay, not knowne but supposed is by the Northeast part or Northpart of Russey, about by that way that Master Burrowes began the discouery, about by a land that is called Noua Zembla, which is a Country or poynt of a land that extendeth to the Northwards, it is not knowen how far, & yet it may be possible that it is nauigable that waies if it were attempted.

I will a little vse my discourse concerning the passage that way vnto Cattay. The way and distaunce vnto the North Cape in Norway is not vnknowne vnto a number of Seamen, the Latitude thereof is 71. degrees twentie minutes, therefore I doe thincke it best to begin the direction and setting out the course East, vntill that they doe come to the land of Noua Zembla, and then falling with that place they are to make their discouery as the land will giue them leaue, and so in this direction it may be possible that they may finde a Sea to giue them passage. It may be also that when they may meete with land, they shall be constrained to goe Northeast or North Noreast, vntill that the North Pole be raised eightie or eightie fiue Degrees, yet they may holde on their course, vntill such time as they shall be incombred with Isle, for it may be so, that in the Latitude of eightie degrees, there shall be no Isle, although that on the Coast of Baccalaos, you may haue Isle, in the Latitude of fiftie degrees, for no man can tell vntill such time as he hath made experience, and now in this passage vnto the Eastwards from the North Cape vntill that they shall haue the Sea open to come into the southwards in the sea of Cattay, it may be about one thousand, or 1200 Leagues, and then in this passage on the starboord side is first Norway and Lapia, and the Bay of Saint Nicolas, and the great riuer of Ob and Noua Zembla, and the East part of Asia, and and on the Larboord side the north Pole, and those lands that lye that waies if there be any, and now in the following of the Coast of the land which may be Southeast, or South Southeast or south, it may be fiue hundreth or 600. leagues

vnto

vnto the Bay of Quinſay in Cattay, and on the Starboord ſide is Aſia and the coaſt of Mangie and Cattay, and on the larboord ſide the maine land of America, &c.

And furthermore, it may be poſſible for to finde paſſage for to go to Cattay, betweene Noua Zembla, and the countrie of Samwetes, through the ſea of Vagates, and this paſſage may be ſomewhat ſhorter, then for to goe vnto the Northwards of Noua Zembla, and then you ſhall haue in this paſſage vpon the ſtarboord ſide, firſt the countrie of Samwetes, as Pichora, & the riuer of Ob and Tartaria, &c. And on the Larboord ſide, Noua Zembla, &c.

And this I do end as touching the Northeaſt paſſage to go or attaine vnto Cattay the fourth way, &c.

As touching the fifth way to goe vnto Cattay, it may be that in my diſcourſe it may ſeeme a meere fooliſhneſſe and a thing vnpoſſible for it to be done, and yet notwithſtanding no man can tell, before that it is put in experience, and yet it is the neareſt way if that it be nauigable, and my meaning is this, for to go directly vnto the Pole, if ſo be that there be no land to let the paſſage. Now it is poſſible that ſome will ſay that it is the frozen Zone, but notwithſtanding if that there be not land that way, then it is not froſen, for the great ſalt ſea neuer freeſeth, and whereas you do ſee the great quantitie of Iſle on the coaſt of Labradore and Bacalayas, it is a token that there abouts is much land towards the North Pole-wards, and ſo is froſen in ſounds and Riuers, and in the breaking vp of the yeere, it doth come driuing out to ſea: for in reſpect they do ſeldome ſee any Iſle at the North cape, nor one hundreth leagues North off from thence, it is a great token that there is no land towards the Polewards, and before that it hath beene put in proofe it cannot be knowen.

But all the doubts for going vnto the Polewards, are for feare of too much cold, and yet notwithſtanding it may be reaſonable warme right vnder the Pole, for any thing that is knowen vnto the contrary, by the long continuance of the Sunne in Summer, for that in the time of nine weekes, the

Sunne

Sunne is neuer lesse than 20. degrees aboue the Horizon going round about them, so that the continuance of the Sunne must enforce the ayre to be reasonable warme, especially if that there be no Ise driuing in the Sea, for it is not so cold at Meta Incognita, if that they be not amongst the Ise, for if that they bee at Sea and not amongst Ise then it is very warme, and also if that they be a shore, then it is warme in like manner, so that the cold is caused by no other meanes, than by the cold breath or aire that commeth from the Ise. And now for to proceede: to goe vnto Cattay, you must goe directly North, till that you bee right vnder the Pole, and then goe South to the opposite part beyond the Pole, which may be done if that you be not let by any land that lieth in the way. The whole distance in this course from the riuer of Thames vnto the Bay of Quinsay, is but 1680. leagues, which is a very shorte way in respect of the other. But now it is possible that some will make argument and say, that it is not possible for any man to make any direction, or set any course being directly vnder the Pole, for that it is not knowen which way that the Compasse will stande, and also in like maner being vnder the Pole, all places is South which way so euer you goe, and also the Sunne is equally one height, so that you can make no proofe which way is forwards, and which way is backwards: therefore it is to be supposed, that some will say, that it is not possible to make any instruments to assigne any course to any place apointed: for trueth it is, that beyng vnder the Pole, any place assigned is south from vs, what quarter of the worlde so euer wee are in, and if that the Sea will giue vs passage, our course is south to go vnto it, &c. Yet notwithstanding, I will shewe vnto you what you shall do to make a perfect-direction vnto any place appointed beeyng right vnder the Pole, so that you shall know whether you do goe backwards or forwards, or any other way that you shal appoint, so that you may see the sunne, & that must be done thus. First prepare a perfect good clocke

that goeth with a Spring, the which clocke must be made in that order that the directer or pointer may goe round in 24. houres, and it must so be marked, that it may end 24. houres at noone, and then to begin one, this clocke or Diall being well made, and keeping the time truly, when that you doe approch neere the Pole within 100. leagues, that is the latitude of 85. degrees, (for so farre the Compasse may serue, and also you may correct the Compasse well inough, for that the Sunne is ten degrees higher on the South part, then it is on the North part) and now being within fiue degrees of the Pole, set your clocke to worke, and let the 24. houre be noone, and then when that you are directly vnder the Pole, looke if that the poynter doth stand vpon the 24. houre, then that part or quarter that the Sunne is in, is right backe againe, and if that it point 12. houres, then towards the Sun-wards is right forwards, and if that it point 6. houres, then the part of the world towards the Sun is due West from you, and is one quarter of the earth, that direction will set you right vpon it, and if 18. houres, then towards the Sunne doth appoint you that place that is East one quarter of the earth. &c.

And now for to let any course to stirre the ship vpon to any place appointed, note this for an ensample, I would goe directly home-wards, and then I will set the Flie of a Compasse before him that shall stirre: and for so much as I come out North, and I must goe home South, I lay the Carde or Flie steadie before me, and the South poynt right with the ships head or stemme, and so I doe set the Clocke by it, now if that the Clocke doth poynt twentie foure houres, for that afore was my noone, then I do stirre the Ship right vpon the Sunne, and if the clocke doth appoint 3. houres, then he that doth stirre must keepe the Sunne vpon the Southwest, and so shall the Ship goe that South that she came from, and if that the clocke doth poynt fire houres, then he that doth stirre, must keepe the Sunne vpon the West

poynt,

poynt, and if the clocke shew 9. then keepe the Sunne vpon the Nozwest. If the clocke doth shew 12. then the Sunne must be on the Nozth point, that is right with the starne of the ship. And if the clocke doth shew 15. houres, then he that stirreth must keepe the Sunne vpon the Nozthest point, if 18. then must he keepe the sunne on the East point, and if 21. houres, then on the Southest point. &c. But now if that you would goe directly fozwards, then lay the Nozth point right with the ships head, and when the clocke doth point 12. then stirre right vpon the Sunne, and so in like maner must you stirre by the Sunne as I haue afoze shewed you by ensamples, so that you may see by this Clocke oz Diall, how you may assigne your selfe to keepe any course into any place in the whole wozld, you being vnder the Pole, and then when that you are departed from the Pole. 100. leagues, that is 5. degrees, then you may vse your Compasse, and cozrect it by the Sunne at your pleasure. And thus much I haue said as touching the passages to goe vnto Cattay, wherefoze gentle reader beare with my rudenes, foz that I am so bold to vse my discourse vpon the passage vnto Cattay. And furthermoze, some men hath been of that opinion, that when that they are in the East Ocean sea, that they shall meete with no shipping, as about Cattay and China. &c. But notwithstanding it is a sea wherein there is a huge number of Ships both great and small, foz whereas there is such great trade of Marchandize, & also such a number of Ilands both great and small, and also such a number of commodities in those Ilands, as any man may iudge that it is likelie that there is great stoze of Ships, and also ozdinance in their shipping, &c. And it is not vnknowen but that the great Cane of Cattay, is a Pzince of great power as well by Sea as by land, then iudge you whether that such a Pzince of such a fozce and wealth will not pzouide foz all things meete foz warres. Therefoze as soone as they come into those Coasts they must ozderly vse the trade of Marchandize, and not

vse force, &c. Moreouer vpon a time I beyng with Master Dee at his house at Murclacke, and falling in talke about the discouery to Cattay and the shipping there aboutes, thereupon he opened a booke and shewed me a note what number of ships the great Cane had readie at one time to goe vnto sea about his affaires, you would thinke it vncredible, for the number was 15000. which is an huge armie by Sea: I replied againe that it might bee that they were but small things, and yet they might call them shippes, and then he turned vnto an other place where the great Cane did send one of his Daughters by sea, and did appoint 14. of his shippes, and the least of the 14. ships had 250. Mariners, beside all the rest of his Daughters trayne and such Nobles as did accompanie her, which could be no small number. Therefore it is most manifest that the Cane is a great Prince of power as well by Sea as by Lande.

FINIS.

A Table of the declination of the seuerall degrees of each signe calculated by T. Hood according to the greatest declination of the Sunne which is now 23. degrees 28. minutes.

Degrees of the signes.	Aries. Libra. D. M.	Taurus. Scorpio D. M.	Gemini. Sagittarius D. M.	Degrees of the signes.
0	0 0	11 29	20 10	30
1	0 24	11 50	20 23	29
2	0 47	12 11	20 35	28
3	1 11	12 32	20 47	27
4	1 35	12 52	20 58	26
5	1 59	13 12	21 9	25
6	2 23	13 32	21 20	24
7	2 47	13 52	21 30	23
8	3 10	14 12	21 40	22
9	3 34	14 31	21 49	21
10	3 58	14 50	21 58	20
11	4 21	15 9	22 7	19
12	4 45	15 27	22 15	18
13	5 8	15 45	22 23	17
14	5 32	16 4	22 30	16
15	5 55	16 21	22 37	15
16	6 18	16 39	22 44	14
17	6 41	16 56	22 50	13
18	7 4	17 13	22 56	12
19	7 27	17 29	23 1	11
20	7 50	17 46	23 5	10
21	8 12	18 2	23 10	9
22	8 35	18 17	12 13	8
23	8 57	18 33	23 17	7
24	9 19	18 47	23 20	6
25	9 41	19 2	23 22	5
26	10 3	19 17	23 24	4
27	1025	19 31	23 26	3
28	1046	19 44	23 27	2
29	11 8	19 57	23 28	1
30	1129	20 10	23 28	0
	Virgo. Pisces.	Leo. Aquarius.	Cancer. Capricorne.	

FOrsomuch as it is meete and conuenient for a Sea-faring man to be able to finde out the declination of the Sunne continually, not onely by the helpe of the Table before set downe according to the day of the moneth, but also according to each seuerall degree of the signe which the Sunne possesseth, therefore I haue heere adioyned a Table of declination Calculated according to the Suns greatest declination which is now esteemed to bee twentie three degrees, twentie eight minutes. The vse of the which Table is as followeth.

First you must search out by the Ephemerides (for that is best to be followed by the common sort) the place of the Sunne, that is to say, what signe and degree and minute the Sunne possesseth. Secondly you are to consider whether the name of the signe which the Sunne possesseth bee set at the toppe, or at the bottome of the Table. If it stand at the toppe, you must seeke the degree of the said signe on the left hand of the Table descending downewarde. But if the name on the signe bee at the bottome of the Table, you must seeke the degree on the right

hand aſcending vpward. Then going on directly from the degree forward eyther towards the right hand or towarde the left as occaſion requireth vntill you come right againſt the name of the ſigne which the ſunne poſſeſſeth you ſhall find the declination. As for example: ſuppoſe the place of the Sunne were the 24. degree of Aries. The name of the ſigne ſtandeth at the toppe of the Table, therefore I ſeeke out the 24. degree on the left hand, and going on from thence towarde the right hande vntill I come right againſt Aries, I finde the declination to be nine degrees 19. minutes.

Againe, ſuppoſe the place of the Sunne to be the 24. of Cancer: I ſee the name of that ſigne to ſtand at the bottome of the Table, therefore I ſeeke out the 24. degree on the right hand, and going on from thence toward the left hand, vntill I come right againſt Cancer, I finde the declination to be 21. degrees 20. minutes.

Thirdly, in the vſe of this Table you are to note whether there be any minutes Adherente, and adioined to the degrees of the ſigne, which the Sunne poſſeſſeth yea or no, as whether the Sunne poſſeſſeth preciſely the 24. degree of Aries or the 24. degree and the 27. 40. or 50. minute, &c. If there be no minutes ouer and aboue the degrees, then the foreſaid Table in ſuch manner, as I ſpake of before affoordeth the declination.

But if there be minutes adioyned to the degrees, then by proportion (otherwiſe called the rule of three) you muſt ſeeke out what declination may belong vnto the ſaid minutes in this manner.

The firſt number in the proportion muſt alwaies be 60. minutes (becauſe we argue from a degree, which is 60. minutes to the parts of a degree, which are the odde minutes Adherente to the whole degree.) The third number muſt alwaies be the odde minutes adioyning to the degree of the ſigne which the ſigne poſſeſſeth: for the queſtion is mooued concerning them. The middlemoſt or ſecond number in the

proportion

proportion must be the difference of delinatiõ betwene the declination of the degree, which the Sunne possesseth, & the nert degree immediatly following according to the natural succession of the nũbers. The which difference may easily be found by the subducting of the declination of one degree out of an other. The second number being found, & all of thẽ being orderly set downe as the rule of three requireth, multiply the third by the second, and diuide the product by the fourth, the quotient affordeth the proportionall part answerable to the minutes propounded.

This proportionall part must be added to the declination of the degree assigned, if the name of the signe stand at the top of the Table, but if the name of the signe stand at the bottom of the Table it must be subducted, so shall you finde the declination of the degrees and minutes. As for example suppose the Sunne possesse 22. degrees, 22. minutes of Aquarius, what shall his declination bee? The first number in the rule of proportion must bee 60. minutes, the third must be 22. for they are the odde minutes adioyned to the degrees) and the second number I find thus. The Sunne possessing the 22. degrees of Aquarius declineth 14. degrees 12. minutes, and possessing the 23. of Aquarius he declineth 13. degrees 52. minutes, the one of these subducted from the other. I find the difference of declination to be 20. minutes, this is the second nũber in the proportion, wherupon I say if 60. giue 20. what shall 22. minutes giue. The quotient according to the rule, is seuen (the fraction being neglected as the custome is in these matters because the common sort careth not for the seconds, &c.) And because the name of the supposed signe which the Sunne possesseth, standeth in the bottome of the Table, therefore I subduct the said seuen minutes out of the declination belonging to the 22. degree, and finde the declination of the 22. degree 12. minutes of Aquarius to bee 14. degrees fiue minutes.

Againe, suppose that the Sunne possesseth the 16. degree 25 minute of Taurus, what shall his declination bee. The difference

ference of declination betweene the 16. and the 17. degree of Taurus is 17. minutes whereupon I say. If the Sunne in going one whole degree, (that is 60. minutes) doe decline 17. minutes, what shall his declination be in going 25. minutes. The quotient according to the rule is seuen minutes. And because the name of the signe which the Sunne is supposed to possesse standeth in the toppe of the Table, therefore I adde seuen minutes to the 16. degree 39. minutes, which is the declination of the 16. degree of Taurus, and there vpon inferre the declination of the 16. degree 25. minutes to bee 16. degrees 46. minutes. Thus much briefely concerning the finding out of the declination of any degree which the Sunne possesseth.

FINIS.

The

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fill

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FINIS.

The Marriners guide.

Set forth in forme of a dia-
logue, wherein the vse of the plaine Sea
Carde is briefely and plainely deliuered,
to the commoditie of all such as haue de-
delight in Nauigation.

Written by Thomas Hood.
Doctor in Phisicke.

The contents of the booke are set forth
in the page following.

Ignoti nulla cupido.

Imprinted at London by Thomas
Wight. 1601.

The contents of this Booke.

1 VVHat things are ſpecially to be noted in the Sea carde.

2 Two places being aſſigned to finde how they beare one from an other diuers waies.

3 From a point giuen in the carde to drawe a line paralell to any point of the compaſſe.

4 To find the Latitude of any place aſſigned in the card.

5 To find how many minutes are contained in any part of a degree of Latitude deſcribed in the card.

6 To find the diſtance of any 2 places aſſigned in the card.

7 The comparing of the Engliſh and Spaniſh leagues together, and the manner how to make the ſcale of leagues.

8 The Rhombe being giuen, and the Latitude to find how farre you haue gone.

9 The way which the ſhippe hath gone being giuen, and the Rhombe to find the Latitude.

10 The way of the ſhippe being giuen, and the Latitude to find the Rhombe.

11 To find the diſtance from the ſhoare.

12 To find how you haue raiſed or let fall the Pole.

13 In rayſing or letting the Pole to fall a degree to finde how many leagues we haue runne.

14 To find the diſtance from the Meridian in rayſing or letting the Pole fall a degree.

15 How to keepe your trauerſe vpon the card.

16 How to keepe your trauerſe vpon the carde of a ſmall pricke as well, as if it were of a great pricke.

17 How to keepe your trauerſe vpon the card though the land lye verie nigh the edge thereof.

To the industrious Saylors health and prosperitie.

Gentlemen Saylors, and what soeuer els you are that trauaile by Sea, for your sake I haue vndertaken this paines. I haue had to doe a long time with diuers of your profession both for the making of Sea Cardes, and also for instructing them in Mathematicall matters belonging to Nauigation. Amongst whom I haue found many willing to learne, and by that meanes had an insight into their wants. I found certaine defects in pricking and vsing of the Carde, and therefore I haue written this little Dialogue concerning the vse of the same, which if you please to peruse at your leasure, I hope you shall find that therein, which shall be profitable to the ignorant, and not vnpleasant to the skilfull, howsoeuer it shalbe either pleasant, or profitable, if you vouchsafe to take it in good part, it will bee a meanes to moue mee, to a farther labour for your commoditie.

Yours Thomas Hood.

The vse of the common Sea Card, written in forme of a Dialogue.

M. NOw in good sooth Philomathes welcome, you are the last man whom I thought off, & I wished for, to the intēt that I might haue a word or two with you, concerning the cō-moditie which your Mathematicall studies haue afforded you, in matters of Nauigation.

P. Sir I thanke you most hartely for your good remembrance, and I must needes confesse, that there was no man, with whom I more desired to speake then with you, partly that I might thankefully acknowledge the profit reaped by your instructiō, and partly that I might request of you a farther matter, which being obtained, I shall thinke it no small increase of that heape of benefits, which many times I haue receaued at your hands.

M. Speake on Philomathes what may it be which you desire, you may commaund me in any reasonable request.

P. Being at sea we were driuen too and froe, as wind and weather serued vs, hauing sometimes the light of the sunne, sometimes of the starres, & somtimes being depriued of them both for a long season: yet notwithstanding the master of our shippe and his mate, with diuers other of the cōpany, had certaine plats, as they termed thē (such as you cōmonly make, though I neuer greatly had regard to their vse) wherin they could keepe a reckoning of the way, which they had made, & set downe a pricke representing the place wherein they were, and perfourme many other prety conclusions. We thought it was most pleasant to see them doe it, though I were much greeued with mine owne ignorance in that matter: yet hauing an hope by your meanes to attaine to the knowledge thereof, I made such hast after mine arriuall, as my businesse would afford to come vnto you, that I might be instructed in the vse of the foresaid Card.

M. Oh

M. Oh Philomathes, that were a dangerous matter for me to vndertake, partly because herein I might seeme to do, as Phormio the Philosopher did, who though hee had neuer seene any campe, dared notwithstanding to discourse of warlike affaires before Annibal, and partly because I should seeme to iustifie this kinde of projection of the plaine Card, which I cannot safely defend, because it is erronious.

P. What, is it faultie? I pray you by what reason doe you proue your saying: they haue beene vsed, and are yet retained by most excellent Nauigators of our time.

The plaine Carde is erronious.

M. I know it well Philomathes, that they are retained by many excellent men, but yet with this dayly wish, that the same might bee amended, and that there might a better projection be made: but hereby you may perceiue the error of these plats, in that the Meridians being parallell, the degrees of Longitude and Latitude which are in them haue not in any respect that Symmetrie and proportion one to another, which the Globe requireth: for in this plaine description of the Card, the degrees of Longitude, and Latitude in each seuerall parallell are of one quantitie, & the Meridians meeting with the parallels, make perfect squares, which is contrary to the nature of the Globe, wherein the Meridians tending to one pole, either Nayth, or Southward, the degrees of Longitude in each parallell betweene the equator and the pole, ware shorter & shorter, according as the parallels come neerer and neerer to the pole, & the Meridians meeting with the parallels, make vnperfect squares, which the Geometricians call Trapezia.

P. In deede I remember that the Saylors many times haue acknowledged some such kinde of faulte, and by supposition imagining that two ships comming from the equator, and being two hundreth leagues a sunder, should bend their course Northward, vnder the Meridian, vntill they came to the 60. paralell, by the plaine Card they cannot be found to be leise then 200. leagues distant one from an other, which is vnpossible, considering that the 60. parallell, is but halfe the

content

content of the equator, & therefore those two ships should be but halfe that distance one from an other, which they were distant vnder the equator, namely, 100. leagues. Moreouer I haue heard them acknowledge this, that there are three things which they can very hardly bring together vpon their plat, without committing an error in the one of them, that is to say, the point of the compasse, vpon which they saile, the distance, and the Latitude: besides the land is greatly distorted from his naturall forme, so that it is nothing like vnto that which wee see described vpon the Globe: but notwithstanding all these things alleaged either by you, or me, let my request preuaile, which is, that you will vouchsafe to teach me how to vse the plaine Card.

M. If you will needes haue mee fulfill your desire Philomathes, I will doe what I can to satisfie you, craving notwithstanding, that this my deed bee not preiudiciall to any other mans, whose experience in Hydrographicall matters is more then mine: when his discource commeth forth, let it be accepted as it shall deserue, in the meane season, let this serue the tourne.

P. Goe to then, first let vs cõsider what things are described in the card, secondly, what vse they haue.

M. The things described in the Card, & especially to be noted are these. First the Hydrographicall description of the sea coast. Secondly the lines drawen ouer the face of the whole Card, & concurring one with an other iointly together in sundry places of the Card in one point, which I terme the center of the flie, for instruction sake, following the common phrase of speach. These lines are commonly called the points of the Compasse, but in teaching because I would gladly auoid the tediousnesse of that name, therefore hereafter I will call them Rhombes, following the Spanish appellation, who hath so intituled them in that (vpon the plaine Carde especially) they represent after a sort the Geometricall figure, which is called a Rhombe. The names of these Rhombes are particularly expressed by certaine letters, both in the

What things are especially to be regarded in the sea card.

toppe, and the bottome of the Carde, the which letters haue this ſignification.

N.	Signifieth	North.
N.B.E.		North and by East.
N.N.E.		North north East.
N.E.B.N.		North East and by north.
N.E.		North East.
N.E.B.E.		North east and by East.
E.N.E.		East north east.
E.B.N.		East and by north.
E.		East.
E.B.S.		East and by South.
E.S.E.		East South East.
S.E.B.S.		South East and by East.
S.E.		South east.
S.E.B.S.		South East and by South.
S.S.E.		South ſouth East.
S.B.E.		South and by East.
S.		South.
S.B.W.		South and by weſt.
S.S.W.		South ſouth weſt.
S.W.B.S.		South weſt and by ſouth.
S.W.		South weſt.
S.W.B.W.		South weſt and by weſt.
W.S.W.		Weſt ſouth weſt.
W.B.S.		Weſt and by South.
W.		Weſt.
W.B.N.		Weſt and by North.
W.N.W.		Weſt north weſt.
N.W.B.W.		North weſt and by weſt.
N.W.		North weſt.
N.W.B.N.		North weſt and by north.
N.W.N.		North north weſt.
N.B.W.		North and by weſt.

And heere I muſt tell you this Philomathes, that for ſo much

much as the mayne vse of the Card dependeth vpon these lines, therefore you must endeuour your selfe tooth and naile, to bee ready not onely in the names, that you may say your compasse both forward and backeward, but also in the lines, that seing of any line you may bee ready to name it, and the line being named, you must be ready presently to find it vpon the Card.

The third thing to bee noted, are the degrees of Latitude, contained betweene two small lines of the left hande of the Card, and hauing their numbers adioyned vnto them seuerally. The fourth and last thing is the scale of leagues both English and Spanishe, sette on the right hande of the Card. These are the cheefest thinges to bee obserued: as for the Cyphers set at the vpper, and neyther ende of the Carde rounde about the Flies, they shalbe expressed heereafter in their place, because they are not essentiall matters touching the substance of the Card, but voluntarily set downe for remembrance sake.

P. Well then I pray you let me vnderstand the vse of the forenamed things.

M. The end of the Hydrographicall description of the coast is to lay forth vnto vs, not onely the Baies, Capes, Angles, Ylands, Mountaines, Ports, Points, and Riuers, but also the daungers of the Sea, so farre forth as they may conuenētly be deliuered to the eie: in the which you are to note, that b signifieth a Baie, c a cape: a an angle, i an Iland: yas Ilands: in a mountaine, po. a port: pa. a point, r, a riuer, t a rocke, & a rocke with other great daunger, if it haue pricks, the sands are expressed by small prickes.

P. There is no difficultie in vnderstanding of this, what say you of the lines which you call the Rhombes.

M. They haue this vse to direct or sette our course from place to place, so that vpon them dependeth the answere vnto this proposition: Two places being assigned to finde the Rhombe, that is to say, the point of the compasse vpon which they lye, and how we are to direct our course from the one vnto 1. Propo.

vnto the other. The which proposition is to be performed 2. seuerall waies generally or perticularly. The generall way is that, which teacheth vs to find out the Rhombe howsoeuer the places beare one from an other, whether they lie iust vpon a Rhombe as precisely North, North East, or South south West, or North and by East &c. or whether they bend somewhat more towards the East, West, north, or south, as when they lie north west, and halfe a point to the westward, or south east, & halfe a point or a quarter, or three quarters to the eastward, &c. The which way to find the Rhombe generally is in this maner. Hauing found out in your Plat the 2. places assigned which I suppose to be M.N. Lay a straight ruler vpon them (if you please you may drawe a line with a fine blacke lead from the one place vnto the other, extending it at large ouer the Carde, both aboue and beneath the 2. places assigned, but it is needlesse for the laying downe of the ruler is as much as the drawing of the line) marke where the said ruler, or line if it bee drawen cutteth any one Rhombe (which or whensoeuer it is) of North and South as for example the line M.N. cutteth the middlemost Rhombe of North and South in the point S. Then take the Semidiameter of the Circle. ABCD. namely the line AE. and according to that Semediameter vpon the point. S. describe an arcke or peece of a Circle the shortest that may bee drawen betweene the Rhombe of North and South, and the line running betweene the two places in such manner as you see the arcke. TW. Take the distaunce of the saide Arcke, TW. and counte it from the point B or the poynt D. eyther to the right hande, or to the left, according as the situation of the line drawen betweene the twoo places assigned shall beste aduise you, (that is to say, if your course lie Southward and to the East, then count the distaunce from D. towarde C. if you runne Southwarde, and to the West, count the distaunce from D. towardes A. But if you sette Sayle to the Northwarde Easterlie, then recken the saide distaunce from B.

The generall way to find the Rhombe.

toward

toward C. if your course be betweene the North and the West, let the distance be accounted from B. toward A) the Rhombe which shall be next vnto the foot of your Compasse, is it vpon which the two places assigned doe lie, and according vnto that Rhombe must your course be directed, if the winde will giue you leaue. As in this example, counting the arcke T.W. from D. toward A. I find the foote of my Compasse to light precisely vpon the Rhombe of South South-west, and therefore I say, that the Rhombe, vpon which M. and N. doe lie, and according to that point of the Compasse must my course be kept from M. to N.

P. But put case that the foote of my Compasses doth not light precisely vpon any one Rhombe, but betweene two of them, how shall I then say the places are situated and lie one from another.

M. In this case you must denominate the position or lying of the two places according to the Rhombe, which shall be found to be next vnto the foote of the compasses, adding these words, and a quarter, halfe, or three quarters of a point more to the South, North, East, or West, as you shall see occasion. This is the generall way to find the Rhombe.

P. But I remember I saw the saylers worke otherwise.

M. You say true, for in searching out the Rhombe, or point of the compasse, they set the one foote of the compasses on the place from whence they put, and ayming, or gessing howe the place vnto the which place they go may beare from it, they extend the foot of their compasses accordingly as the Rhombe requireth, at the which they gessed, directing the foot of their compasses vpon the said Rhombe from the place of their departure vntill they come vnto the place vnto the which they entend to goe: But trust mee Philomathes there is no way more readie & certaine, generally, then that which I haue set down, for if it be followed precisely according to my prescription, you cannot misse the bredth of an heire in finding out any Rhombe betwene 2 places assigned, because it bringeth forth the iust angle of position according ỳ description of the Card.

P. I hope practise will bring readinesse: What is the particuler way to finde out the Rombe.

The particular way to find the Rhombe.

M. The particular way is that which requireth a certaine position, or situation of the two places assigned, and it is two fold, hauing a double worke according as the two places are diuersly situated from, or neere vnto the Meridian. For this you may easily perceiue by your Carde, and by common sense, also that sometimes the assigned place, to which you bende your course, may be verie neare vnto the Meridian of the place, from whence you departe, sometimes the place to the which you goe, may be farre off from the Meridian from whence you set saile, and neare vnto the East or West point of the compasse: whereupon there ariseth a twofolde worke in this manner to be performed. If the places lye neare the Meridian one of an other, (namely if they lye not more then Northeast, or Northwest, Southeast, or Southwest, one from an other) lay your ruler vpon them both, and marke where it cutteth any two of the paralell Rhombes, which runne East and West.

P. Doth it not make any matter which two paralels they be, which the ruler cutteth, whether they be in the middest, at the bottome, or at the top of the Card.

M. It is neither heere nor there, which paralels you make choise of in the performing of this conclusion, but it is best to choose those two paraleles, which are nigheſt together, be they whereſoeuer (so that the ruler doth touch them both) for sauing of your labour in extending of your compasses, as for example: if that I were to goe from M. to N. I lay my ruler vpon them both, and finde that it cutteth all the paralell Rhombes of East and West, from N. downeward in the points, a. b. c. d. and e. but I make chiose onely of the two neithermost paralels, and with my compasses I take the distance betweene the two points d. and e. wherein the ruler cutteth the paralels.

P. When this distance is taken, what is then to be done, and how must I proceed to find the Rhombe?

M. Your

M. Your compasses being kept at their extent, make choise also of the centre of some one flie, being in either of the two foresaid paralels. (as for example,) I make choise of the center E, which is in the uppermost of the two paralels: in that center E. I set the one foote of the compasses, and turne the other foote downewarde to the other paralell, setting it precisely in the same: The Rhombe, upon which the foote of the compasses doth fall, is that, whereon the two places assigned doe beare one from another, as for example, I find the foot of the compasses to light iust upon the Rhombe of South Southwest, wherefore I conclude that to be the point of the compasse upon which N. beareth from M. and according to that (so neere as may be) must I shape my course.

P. Yet here ariseth one doubt, which is this: when I set the one foote of my compasses in the one paralell, and turne the other foote toward the other paralell, is it not materiall which way I turne the said other foot, either to the right, or to the left hand?

M. Yes, it is greatly to be regarded, this must be your generall rule, namely, that as your ruler lieth so must your compasses be situated, that is to say, the right line supposed to be drawen from the one foote of the compasses vnto the other, must be paralell to the side of the ruler: so shall you be sure to finde out the Rhombe, because this is a principle, as it were, concerning the Rhombes described in the plat, that all lines eyther actually, or by imagination equidistant therein one vnto an other, haue one and the same denomination.

P. And as I guesse, I must obserue that also in that rule, which you taught me before, namely, that if the feete of my compasses being situated orderly, shall not precisely touch any of the Rhombes, than am I to entitle the position of the two places according to that Rhombe which shall be nert vnto the feete of my compasses, adding these words, and a little more to the Southword, or Northward, &c. As the fall of the compasses shall best aduise mee.

M. You

M. You say well: Thus much concerning the first particular way of Searching out the Rhombe, when the two places assigned lie neere to one an others Meridian. But if it shall so fall out, that the two places assigned in your plat lye not neere vnto one anothers Meridian, but beare almost East and West one from another, then can you not vse the former way conueniently, because eyther the compasses will not reach the two paralels of East and West, as they did before, or else their extent will be verie great, and the intercection of the ruler and the paralels will be so oblique, that you cannot iustly discerne where to pitch the foote of your compasses. Therefore in this case you shall worke thus. Lay your ruler vpon the two places assigned, and marke where it cutteth any two Rhombes of North and South (which hereafter for instruction sake I will call Meridians, because in deede they are so,) As for example, I lay the ruler vpon O. and P. and finde it to cut all the Meridians from P. toward my left had, but for the performance of this conclusion, I make choise only of those two which are next vnto P. toward the said hand, the wich Meridians are cut by the ruler in the points, f. and g. Take the distance of the two points, and setting the one foote of your compasses in any center of any flie, which is in either of the Meridians (as for exeample, set it in the center W.) turne the other foot of your compasses about, vntill the other foot touch the other Meridian (prouided alwaies that the situation of your compasses be like vnto the situation of the ruler) the Rhombe vpon which the said foote of the compasses doth eyther precisely light or come nearest vnto, is it, which giueth the denomination to the position of the two places assigned whereby in this exrample I say that P. beareth from O. West and by South, and O. lieth from P. East and by North. Thus much byefly for finding out the Rhombe eyther generally or particularly.

P. It followeth therefore now to speake of the degrees of Latitude.

M. You say true Philomathes, so our methood doth require, that

that we should so proceed, but for so much as mine experience in pricking of the Card is more then yours, I thinke it not amisse to teach you a conclusion (which is the conuerse of that which went before) because it is of great vse: you haue learned how to find out the Rhombe that thereby you may direct your course frō place to place, now learn this also Frō a point assigned in the Card wheresoeuer, to draw a line paralell to to any Rhombe assigned. But before I proceede I must aduise you of this, that the worde Rhombe in this proposition must be largely taken, as it was before, not onely for any line direction vsually expressed vpon the Card, but also for any line by imagination concealed to be drawen betweene them, as that which is drawen Soutwest and halfe, or a quarter, or three quarters of a point to the Westward, & such like, wherupon we say that this conclusion may be wrought also generally or particularly. For this you know that sometimes we may name a Rhombe precisely and simply, without any addition, as when I say that from the point O would haue a Rhombe drawen West and by South directly: sometimes we name a Rhombe with this addition a quarter, halfe, or three quarters of a point more toward such or such a coast, as when I say that from the point I. I would haue a Rhombe drawen Sottheast and by South, and halfe a point more vnto the Eastward: How soeuer the question is propounded, you shall generally absolue it thus. From the point assigned (as for example, from I) draw an infinite right line (that is to say, a line long enough to serue your turne) paralell to the next Meridian line (if the point assigned be not in the Meridian, for then this labour is saued.) Afterwards with your compasses take the length of the semediameter E D. which is at the nether ende of the Card toward the right hand, according to that semidiameter vpon the point giuen, namely vpon I describe an arcke or peece of a circle K L.

2. Proposition.

P. But where, or on which side of the line shal I describe the said arcke shall I describe it aboue, or beneath the point assigned, againe shall I describe it on the right or on the left hand?

M. You must describe the foresaid arcke according as your course requireth, that is to say, if your course lie to the Southward, Easterly, or ful East, describe the arke beneath the center or assigned point toward the right hand, if your course lye Southward, Westerly, or full West, describe it beneath the center or assigned point toward the left hand. If your course lye Northward, Easterly, or full East, describe the foresaid arcke aboue the assigned point toward the right, but if it be Northward Westerly, or full West, describe it toward the left hand: as in the example propounded, because from the point I. it is required that I should drawe a line Southeast and by South, and halfe a point more to the Eastward, therefore the foresaid arcke K L. is described beneath the center or assigned point toward the right hand.

P. Hitherto I vnderstand you: but let vs proceede, when as vpon the center or assigned point I haue described an arcke according as my course directeth mee, what must I then doe?

M. If your course lye Northward set the one foote of your compasses in the point B. which is on your right hand toward the bottome of the Card, but if your course lie Southward, set it in the point D. and extend the other foote vnto so much of the circumference, as is contained betweene B, or D. and the Rhombe assigned, as in the example propounded, I extend my compasses from D. to the Rhombe of Southeast and by South, and halfe a point more vnto the Eastward, that is to say, I take the distance betweene D. and X. and then setting the one foote of my compasses thus extented in the beginning of the arcke, which I drewe before, namely in the point K. with the other foote I make a marke in the same arcke in the point L. The right line drawen from I. (which is the point giuen) vnto L. is the line desired, paralell to the Rhombe of Southeast and by South, and halfe a point more vnto the Eastward, for it maketh the same angle with the Meridian I K. which the line E X. maketh with the Meridian E D.

This

This is the generall and most certaine way of drawing the Rhombe from a point giuen. But if it so fall out that the Rhombe, which is to be drawen from the point assigned, be simply named without addition of halfe a point more or lesse towards such, or such a coast, then you shall describe the said Rhombe thus. Among all the lines described ouer the face of the Carde, seeke out (so neare vnto the assigned point as may be) such a line as beareth the same denomination with the desired Rhombe: as for example, if from the point Q. you were enioyned to draw a Rhombe Southwest and by West, seeke out a line that may beare that denomination, (the which as it falleth out in this Card is that line that commeth from the Westermost part of England to the yland of Faial among the Aeores, namely the line y. Z. Then setting the one foot of your compasses in Z. (that is, in the assigned point) put forth, or pull in the other foot so long, vntill you may but touch the line y. Z. Afterwards set the one foote of the compasses in some other place of the line y. Z. either to the North or Southward as the desired Rhombe shal best aduise you, as for example in the point Z. and with the other foote make an arcke of a Circle, on that same side of the line, vpon which the assigned point is, namely the arcke R. the right line drawen from Q. the point assigned to the toppe of the said arcke is paralell to the Rhombe, desired. Thus much concerning the finding out of the Rhombe, & the manner howe to draw a line paralell vnto any of them from a point assigned. Let vs now proceede Philomathes to the vse of the degrees which consisteth in this especially, any place being assigned in the Carde to finde the Latitude thereof.

P. By the Latitude you meane the distance of any place from the Equinoctiall eyther to the North or Southward, according as is commonly taken in Geographical matters.

M. I doe so vnderstande it, and heere you must note also, that for so much as the latitude of any place, & the height of the Pole at the same place are all one in number, though they be counted in seuerall manners, and from diuers places,

(for the Latitude as you know is counted from the equator toward the Zenith, or vertuall point in the heauen right imminent ouer the place wherein we are, but the height, elecation, or Altitude of the North Pole is counted from the Horizon to the Pole it selfe) therefore they are vsually confounded, and we say that by the Card we may finde in what height any place is, or what Altitude or elecuation the Pole hath aboue the Horizon of any place expressed in the Card: whereas in truth the degrees commonly expressed in the Card are not the degrees of the elecuation of the Pole, but the degrees of Latitude. The which Latitude of any place assigned is found out thus.

Set the one foote of your compasses in the place assigned (as for example in the point O) and with the other foote take the shortest distance from thence to the next paralell of East and West, either aboue or beneath it, so that your compasses being stretched forth, you may but touch the paralell. Then running with your eie along that paralel toward the Scale of Latitude, mark where ẏ paralel cutteth the said Scale, there set the one foote of your compasses, and turne the other eyther vpwarde or downewarde in the same Scale, as the place assigned shall best aduise you, the degree vpon which the foote of the Compasses lighteth, expresseth the Latitude of the place, and consequently what height you are in.

As in this example you shal find the point O, to be in the 40 degree of Latitude. And heere you are to note that if the place assigned be in any paralell of East and West, then is your labour saued, for the paralell it selfe directeth you to the Latitude.

A briefe rule concerning the finding out the Latitude.

P. I perceiue your meaning well: and mee thinketh I coulde frame a short rule vnto my selfe thereby to find the Latitude in this manner. If from the place assigned to the Scale of Latitude there be a right line drawen paralell to the Rhombe of East & West, the degree of the scale, vpon which the said paralell lighteth, expresseth the Latitude sought for:

as you may perceaue by the line O.G. which cutting the scale of Latitude in the 40. Degree, expresseth the Latitude of O.

M. Your rule is good: And here you are to note, that when your search the Latitude of any smal yland in the Card you must take your measure from the middest thereof.

P. In searching out the Latitude of many places, there is one thing that troubleth me, because I know not what to say certainely. When my compasses light precisely vpon the beginning or end of a Degree, then can I tell the iust Latitude of the place, because the seuerall numbers adioyned expresse the same: But if the Compasses fall betweene the beginning and ending of a degree, what shall I then say?

M. If the foote of your Compasses falleth iust in the middest of a degree, there are 30. minutes to be added to the number of the whole degrees: if it falleth on the 4. part you must adde 15. minuts: if on the third part, you must adde 20. minutes.

4. Proposition. How many minutes are contained in each part of a degree.

P. I graunt that also, but considering that this Card yea and very fewe others haue such subdiuisions into quarters or terces of a degree, I pray you giue me some generall rule whereby I may know what minutes are aunswereable vnto any part of a degree contained betweene the beginning of the saide Degree, any pricke made at all aduentures within it.

M. If you doe remember it, I deliuered vnto you such a conclusion in that Bocke, which I wrought concerning the vse of both the Globes Terrestriall and Celestiall. The selfe same rule which I did there write touching the Degrees of a circle either of the Globe, quadrant, or astrolabe, may be heere applied to a right line deuided into degrees. Therfore when as the foote of your Compasses lighteth betweene the beginning and ending of any Degree, and you are desirous to know what number of minutes that parte of the degree may containe which is betweene the beginning of it and the foote of your compasses, you shall satisfie your selfe in this manner. Take the portion of the degree assigned, and begin-

ning at the neithermoſt degree of the card, coũt it frõ thence vntill you haue reckened 60. times, noting well, where you make an end, for the number of the whole degrees comprehended betweene the degree, where at you firſt began, & the point, wherein you ended, expreſſe the number of minuts cõtained in the portion of the degree propoũded. Otherwiſe to auoid the tediouſneſſe of turning the compaſſes ouer ſo many times, you may do thus: count the ſaid portion of the degree 5. times ouer, noting well where your compaſſes lighted at the firſt time, from thence extend the foote of your compaſſes vnto the degree where at you began, & from that degree coũt the ſaid diſtance 12. times ouer, noting, well where your cõpaſſes lighteth at the 12. time, for (as I ſaid before) the number of the whole degrees cõprized betwene the degree, wherat you firſt began, & the point, wherein you ended expreſſe the nũber of minutes contained in the portion of the degree propoũded. Now if it ſhall ſo fall out at any time, that the portiõ of the Degree betweene the beginning of it, and the foote of your compaſſes ſhall be ſo little, that your compaſſes cannot be brought cloſe enough together to take it (as many times it falleth out by reaſon of the ill workemanſhip of the compaſſes) then take the portion of the degree remaining contained betweene the foote of your compaſſes and the end of the ſaid degree, count that portion as you did the other, noting how many degrees of the ſcale of Latitude are contained betweene the place where you began, & the point wherein you ended, that number of degrees being ſubducted from 60. expreſſe how many minutes are contained in the foreſaid ſmall portio n. Moreouer if the number of the degrees in the ſcale of Latitude be ſo few, that you cannot account the portion of the degree aſſigned 60. times, then count it but 30. times, and double the degrees contained betweene the beginning & the end of your account or elſe count the ſaid portion but 15. times, and quadruple the ſaid degrees. So ſhall you alſo find the minutes. As for example, if in counting the portion of the degree aſſigned 15. times ouer, you find 11. degrees & a

quarter

quarter to be contained betweene the place where at you beganne, and the place whereon you ended, multiplie those degrees and the quarter by 4. and you shall find 45. minutes to be contained in the portion of the degree assigned.

P. Now tel me this I pray you, were it not good that the degrees of Latitude were greater.

M. It were good in deed for him that is but a yoong Scholler in pricking of his Card, but otherwise to an expert and cunning man it is neither here nor there, though they were halfe so small againe: And I will teach you hereafter how you shall keepe your trauerse vpon your Card though the degrees of Latitude be but small, as well as if they were two inches long.

P. Let vs now proceed to the scale of leagues, what vse hath it? The vse of the scale of leagues.

M. The vse therefore is to finde out the distance betweene place and place: So that the conclusion to bee performed thereby it is this: two places being assigned to finde their distance. In working of this conclusion, this is to bee noted, whether the places ginen are of lesser distance, are farther of one from an other, then the length of the scale amounteth vnto. If the two places bee of lesser distance then the length of the scale (as the points I and H are) extend your compasses from the one vnto the other, and apply them afterward to the scale of leagues (beginning at the left end thereof) and you shall finde the distance of the places assigned eyther according to the English or Spanish account. But if the distance of the places assigned surmounteth the length of the scale of leagues, then with your compasses take either the length of the whole scale, or some certaine nũber of leagues, as 20. 40. 50. or 100. and lay your rular vpon the 2. places assigned, or else with a fine blacke lead draw a line from the one vnto the other, afterwards beginning at either of them, count the number of leagues which you tooke out of your scale (keeping your cõpasses close by the rulars side) as many times as you cã betweene them: Still adding the number of the

the leagues as you goe on. If at length the foote of your cõpasses lighteth iust vpon the other place assigned, then doth the totall summe of the leagues added together expresse the distance of the 2. places. But if in setting the foote of the cõpasses forward, you find that it falleth beyond the place propoũded, then bearing in mind the total summe of the leagues all ready reckoned, & pulling in the foote of the compasses vntill it touch the place assigned, & applying them vnto the scale of leagues, you must adde the leagues cõtained between their feete, vnto the summe found out before & noted in your mind, for the totall number expresseth the distance of the places assigned. As for example, desiring to find the distance betwene I and R (the which point R. is neare the Iland of S Marie,) I take out of the scale 50. leagues, and counting the said by the edge of my rular 4. times, which make 200. leagues and turning the foote of my compasses the fifte time toward the place assigned, I find that it ouer reacheth the place: wherefore bearing in mind the former 200. leagues, I pulled in my compasses vntill the foote touched the place assigned, and applying them vnto the scale, I found 87. leagues to be contained betweene their feete, which being added vnto the other 200. declare the distance of the 2. places to be 287. leagues according to the English account.

P. In good time were those wordes mentioned, for looking vpon the scale of leagues I foũd on the vpper part therof these words English leagues, & vnder it Spanish leagues: what meanes these words.

M. They are there set to signifie the difference betwene vs and the Spaniards in counting of distaunces. We attribute vnto euery degree on earth (that is vnto the 360. part of the Compasse of the earth) 20. leagues, each league containing 3. miles, so that wee make the whole Compasse of the earth to be 7200. leagues, or 21600. miles. The Spaniardes hauing their miles longer then ours, attribute vnto each degree but 17. leagues and a halfe, so that by their account the circuite of the earth is 6300. leagues, and one of

their

their miles is vnto one of our ſeſquiſeptima, that is as 8. is to 7. and ſeauenty, of their Leagues make eightie of ours. Wherevpon you ſhall note this, that many times 2 places are ſaid to be of a diuers diſtaunce one from an other, yet are the places ſet where they ought to be, and there is no errour in the Carde, but the difference ariſeth vppon the account diuerſelie made betweene vs and the Spaniards. As for example from Cape Finiſter vnto Po. Santo according to the Spaniſh account are 200 leagues, but according to our account it is more by 24. wherefore in pricking of your Carde you muſt haue a diligent eye to your ſcale, leaſt in miſtaking the one kinde of Leagues for the other, you miſreckon your ſelfe and finde fault with your Carde where there is none. Is there any thing elſe which you would craue concerning the ſcale?

P. Yea, I haue a queſtion or two to be aſked. If there be no ſcale in my Carde what ſhift ſhall I vſe to make one?

M. I tolde you euen now that euerie Degree according to the Engliſh account is twentie Leagues, therefore fiue Degrees are one hundreth leagues, and two Degrees and a halfe are fiftie Leagues, ſo that if you take fiue degrees of the ſcale of Latitude, and diuide them into 10 partes, each portion ſhall be 10 Leagues, and each of them diuided into 5 parts, are 2 Leagues. But if you diuide the 5 Degrees into 8. partes, then is each part 12 leagues and ½. The Spaniſh ſcale is thus made, 80 Engliſh leagues as I ſaid before, are but 70 Spaniſh, therefore if you take foure degrees of Latitude and diuide them into 7 peeces each portion is 10 Spaniſh leagues.

P. I perceaue that I may make my ſcale of Leagues by the degrees of Latitude. I pray you therefore contrariwiſe tell me, when the Carde hath no degrees of Latitude, but a ſcale of leagues, how ſhall I finde out the length of the Degrees of latitude whereby the carde was made?

M. The quantitie of each degree of Latitude is eaſely found out by the Engliſh leagues, becauſe 100 Engliſh

make iuſt 5. degrees: but if the leagues be Spaniſh, you muſt diligently note this, whether the greater diuiſions of the Scale containe ſeuerally 10 leagues or 12 and ½. If they containe 10 Leagues a peece, ſeauen of them diuided in 4. parts make 4. degrees, but if the foreſaid parts be each of them twelue Leagues and ½. then take ſeauen of them which amount vnto 87 leagues and ½. and diuide them into 5. peeces which make 5. degrees of Latitude, euery one containing ſeauenteene leagues and ½.

P. The third thing which I ſtand in doubt of is this: when the Card hath neither Degrees of Latitude nor ſcale how I ſhall make them both.

M. This cannot be done vnleſſe that the diſtaunce betweene ſome two places in the Card be certainely knowen, and then it may be gathered out of that which hath been ſaid before, eſpecially if the two places aſſigned lye North and South one from an other. As for example, if I know that the diſtaunce betweene cape Vincent and the rocke is 40 Engliſh leagues, or two degrees of Latitude, I may out of that diſtaunce eaſely gather the quantitie of my ſcale of Leagues and degrees.

P. Let vs now proceede: Hetherto we haue ſpoken of the Rhombes, of the Scale of Latitude, and the Scale of leagues, as they were to be conſidered ſeuerally each one by it ſelfe, what is to be conſidered in them being ioyntly vſed and linked one with an other.

5. Propo. M. There ariſe out of them being ioyned togeather, many concluſions: As firſt of all this. The Rhombe being giuen and the Latitude, with which you ſail, to finde the diſtaunce or the way which the Ship hath made from any place aſſigned. The performance of the which propoſition may thus briefely be deliuered. If from the place aſſigned there be a right line drawen parallell to the Rhombe aſſigned, and from the degree of latitude there be an other line drawen equidiſtant to the Rhombe of Eaſt and Weſt, cutting the foreſaid line in ſome certaine place. The length of

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the right line contained betweene the point of the intersection where the cut is made, and the place of your departure being applyed to the Scale of leagues, expresseth the distaunce or the way which the Ship hath made.

As for example. I suppose that from the point N. I went South and by East three quarters of a point more to the Eastward, vntill I fell with the 40 degree of Latitude. Therefore (by the second proposition of this booke) from N. I draw a line parallel to the Rhombe of south and by east, &c. and from the 40 degree of latitude, I draw an other line parallell to the Rhombe of East & West, the two lines drawen concurre & meete in the point O. the length of the line N. O. applyed to the scale expresseth the distance to be 75. leagues.

An other conclusion is this: The distaunce or way, which the Ship hath made, being giuen, and the Rhombe to finde in what latitude you are. The proposition is thus performed. If in the right line drawen from the place assigned parallell to the Rhombe giuen, be limited according to the scale of leagues, the distaunce or way which the Ship hath made, the right line drawen from the end of the said distaunce parallell to the Rhombe of East and West shall cut off in the scale of Degrees the latitude sought for. As for example from N. I went South and by East three quarters of a point more to the Eastward seauenty fiue leagues, I demaund with what Latitude I fell. From N. I draw a line parallell to the Rhombe of South and by East, &c. (by the second proposition) in the which line I account the distaunce that is seauenty fiue leagues from N. to O. then from O. I draw a right line parallell to the line of East and West, which cutteth the scale of latitude in the fortie degree, which is the degree sought for. 6. Propo.

The third conclusion is this. The distaunce being giuen, and the Latitude to finde the Rhombe, Your rule is this: If from the Latitude giuen towarde the place assigned there be a right line drawen parallell to the Rhombe of East and West, and on the place assigned being the center 7. Propo.

there be a circumference described, hauing for his Semidiameter the distance giuen, and cutting the foresaid parallell at all aduentures in a point on that side of the meridian, on which your course doth lye the right line drawen from the place assigned to the sayd point wherein the section was made, shall expresse the Rhombe desired. As in this example. Suppose that going from N. 75 leagues, I found my selfe to be in fortie degrees of latitude, I would know vpon what Rhombe my course was made.

From the 40 degree of Latitude, I draw a line O G. parallell to the Rhombe of East and West. Then with my compasses I take out of the scale 75 leagues, and setting the one foote of them in N. (that is in the place assigned from whence I departed) with the other foote on the right side of the Meridian, because my course lyeth Easterly, I make a circumference, cutting the line O G. in the point O. I draw a right line from N. to O. which by the first proposition I finde to be the Rhombe of South east and three quarters of a point more into the Eastward, vpon which I made my course.

P. In making of the circumference mencioned in your rule, why do you bid me cut the Parallell on that side of the meridian on which my course doth lye?

M. Because the Parallell lyne which is drawen from the scale of Latitude may be cut as well on the East as on the West side of the Meridian from whence you depart, and therefore in answering to the former proposition, there is a secret consideration to be had with your selfe, which way your course doth lye, whether to the right or left hand of the Meridian, the which consideration being had, and the compasses being guided accordingly, we may easely finde out the Rhombe.

P. These three conclusions me thinketh should be not onely pleasaunt, but also very commodious for the saylor, because by either of them he may easely and readily finde the place wherein he is, which as I remember they called the

pricking

pricking of the Card: for the point wherein the Rhombe assigned, and the Latitude; or the assigned Rhombe, and the distance; or the assigned Latitude and the distance doe concurre, expresseth the place wherein he is.

M. You say true Philomathes, and for so much as there are three things whereby the sea-faring man may help himselfe by meanes of his card, that is his Latitude, his distance or way which his ship maketh, and the Rhombe, vpon which he shapeth his course, hereby he may assure himselfe two of them being giuen (namely the Rhombe, and the Latitude, or the Rhombe and the distance, or the Latitude & the distance) whether he hath erred in the other yea or no, and how much he hath erred. As for example: If in sayling from N. to O. South and by East three quarters of a point more into the Eastward, and finding my selfe to be in the 40 degree of Latitude, I shall affirme that I haue runne 75 Leagues, by the first of these three conclusions which is the fifth proposition, I shall certifie my selfe whether I kept the reckoning of my way trew, yea or no, for my compasses being extended to that number of leagues, and the one foote of them being set in N. if the other foote reacheth iust vnto the point O. wherein the Rhombe and the Latitude are supposed to concurre, I may assure my selfe that my distaunce was truely obserued. But if the foote of the compasses shall fall either short off, or beyond the point O. then haue I erred in obseruing the way of the Ship, and the distance betweene the foote of the compasses and the point O. being applied to the scale of leagues, expresseth the quantitie of mine error. Secondly, if by the diligence of mine obseruation I can assure my selfe that I haue run South and by east, three quarters of a point more to the Eastward 75 leagues, and at length obseruing the Sunne or Starre, shall auouch that I am in the 40 degree of latitude: then pricking out my course vpon that Rhombe from N. to O. if that the right line drawne from the 40 degree of latitude parallel to the Rhombe of East and West, doth not precisely concurre in the point O. but falleth either

about or beneath it, then haue I erred in taking my latitude, and the quantitie of myne error is bewraied by the shortest line drawen from the point O. to the said parallel. In like manner if by my obseruation precisely made, I can warrant my selfe of my distance and of my latitude, and shall auouch, that from the point N. I went South and by East three quarters of a point more to the Eastward. If from the point N. I draw such a Rhombe (by the second proposition) and it shall not concurre in the point O. wherein the latitude and the distance do concurre, then may I say that I haue erred in the Rhombe, and the quantitie of mine error is to be found by the arcke of the circumference contained betweene the point O. and the Rhombe drawen.

P. I perceaue that these things do follow, and are conueniently inferred out of the three former conclusions, but may they be taken as certaine and trew?

M. Oh Philomathes, you know I told you before, that the plaine card was not in all points correspondent to the dimensions of the Globe, and therefore there cannot a most exquisite and a precise truth be warranted thereby, but for so much as the common marriner (the more is the pitie) hath no better helpe, I teach him and you how to make a benefit and a pleasure vnto himselfe of that, which he hath, so farre forth as the thing it selfe will permit him. Let vs now proceede. This also may be performed vpon the card: Two places vpon the shoare being knowen, and the point of the compasse vpon which they beare from you, to finde how farre distant you are from the shore, in a direct course, or from either of the two places.

The eight proposition.

P. But is it not materiall whether I be thwart of the one of the two places yea or no?

M. It maketh no matter: let them lye from you how soeuer, so that you and the two places be not in a right line. Your rule is this. If from the two places assigned there be Rhombes drawen opposite to the two Rhombes vpon which the two places doe beare: the distance betweene the concur

of

of those two Rhombes and the shoare, or the places assigned, will expresse how far off you are from either of them, or from the shoare it selfe.

P. What meane you by the two Rhombes which are to be drawen opposite vnto the Rhombe, vpon which the two places do beare.

M. This is my meaning, that if the one place doth lye East and by North, you should draw a Rhombe from it west and by South, and if the other place lye East southeast, you should draw a Rhombe from it west north west. For alwaies the concourse of the opposite Rhombes will expresse the place wherein you are, which being once knowne, you may by the scale of leagues easely gather how farre you are distant from any place. Moreouer vpon the carde this may be performed: the Rhombe and the distance being giuen to finde how we haue raysed and let fall the Pole. For if in the Rhome assigned (as for example) in the line N O. we count the distance vnto the point O. from the point N. the parallells drawen east and west from the points N. and O. shall in the scale of latitude comprehend betweene them the degrees which we haue shifted in the height of the Pole. The ninth Proposition.

P. Now that you haue made mention of raysing the Pole, I pray you tell me, may not this conclusion be wrought vpon the card, in raysing or letting the Pole fall a degree to finde how many leagues we runne vpon any Rhombe assigned? The tenth Proposition.

M. Yes that you may Philomathes, and that so much the better in that the question is but of one degree, for in many degrees the error would appeare, as may be gathered by that which hath bene said heretofore concerning the projection of this card. And forsomuch as each seuerall degree of this card is somewhat to little wherby to worke this conclusion cõueniently, therefore suppose that 5 degrees of your card were but as one, then must each degree be 4 leagues, & halfe a degree must be 2 leagues. This being supposed, make choise of some one center of a flie within your card, as for example,

I choose the center D wherein the Rhombes doe concur on the left hand of the card: aboue that center from the point F which is distaunt from D the length of 5 degrees counted notwithstanding but as one, I draw a right line parallell to the Rhombe of east and west, cutting the Rhombes proceeding from the point D. in the points a.b.c.d.e.f.g. Then making the line D F your scale, (the which because it is supposed to be a degree) it must of necessitie be accounted for 20 leagues, if you measure therewith the lines Da. Db. Dc. Dd. De. Df. Dg. you shall easely finde how many leagues you run vpon any Rhombe, in raysing, or letting the Pole fall a degree.

11. Propo. P. But of this me thinketh also that I may inferre an other conclusion which is this: The Pole being raised or let fall a degree to finde how far I am distant from my meridian running vpon any Rhombe assigned.

M. You say trew: for if by the said 5 degrees taken but for one, being in quantitie 20 leagues, you measure the distance betweene the points F and a. F. and b. F and e. &c. you shall finde the distaunce betweene the meridian and each seuerall Rhombe. These conclusions Philomathes, aforesaid, being noted diligently, it followeth now to teach you that, which is the summe of them all, wherein they must all iointly concurre togeather, the which conclusion is this: How to

12. Propo. keepe your trauerse vpon the card. The which proposition though it be in words differing from the rest, yet is there nothing in it, which hath not bene seuerally deliuered in the former propositions, so that it requireth onely a derteritie in practising, and working that which you haue learned, as shall appeare in this example. Suppose that I were to go from H. to Saint Maries Iland, the which two places as it may appeare by the first proposition do beare one from an other southwest and by south two thirds of a point more vnto the westward, and by the fourth proposition I finde them to be 332 leagues asonder, but making my course vpon the foresaid Rhombe, I was no sooner from the shoare, but I was

carried

carried first with an easterly winde 100 leagues to the westward. Secondly, I was carried from thence to the South east a quarter of a point more to the eastward 90. Leagues. Thirdly, the winde comming about, I was carried south southwest 72 Leagues. Fourthly, I was driuen by tempest south and by east three quarters of a point more vnto the eastward I know not how farre, but I found my selfe to be in the 40 degree of Latitude. Fiftly I was from thence enforced West and by South 60 leagues. Sixtly, I was with a contrary winde put North northeast 40 Leagues. Seuenthly, I ranne 160 Leagues I know not vpon what Rhombe certainely, but it was to westward of the meridian, vntill I shifted my Pole foure degrees and a quarter. I demaund in what place I might be, and what Rhombe it was vpon which I ranne last. 2. what Rhombe I should haue kept to the place wherein I finde my selfe to be if I had not found the winde contrarie. 3. how many leagues I am from the place of my departure. 4. how I haue shifed the Pole. 5. How farre I am from my Meridian. 6. How many Leagues I haue to R. 7. What Rhombe will set my course thether.

P. If it please you sir I will see how I can answere the question.

M. Do so, it will be good for you alwaies to practize that which you know.

P. First by the fourth proposition from H. westward I count 100 leagues to the point I. Secondly by the 2 proposition I drawe the Rhombe of South East a quarter of a point more to the Eastward, from the point I. to L. and in it from the saide point I. count 90 Leagues to the point M. Thirdly by the second proposition from the point M. I drawe the Rhombe of South south West, and count therein seauentie two leagues from M. to N. Fourthly by the 6. proposition I finde my selfe to be in the point O. which is in the fortie degree of Latitude and 75. Leagues from the point N. Fiftlie by the 2. and 4. propositions I finde

my ſelfe to be in the point P. that is Weſt and by South 60. leagues from O. Sirtlie by the foreſaid propoſitions, I finde my ſelfe to be in Q. which is North Northeaſt 40. leagues from P. Laſt of all by the ſeauenth propoſition, I anſwere that I finde my ſelfe to haue kept my courſe Southweſt and by Weſt, and to be at the point R. Secondly if I had not bene moleſted with contrarie windes, I might haue runne Southweſt and by South halfe a point more to the Weſtward. Thirdlie I am three hundreth thirtie 2 leagues from H. Fourthly I haue ſhifted the Pole 13. Degrees $\frac{1}{4}$. Fiftlie I am from the Meridian of H. according to this proiection of the Carde two hundreth 14. leagues. Sixtlie I haue vnto the Iland of S. Maries, about 12 Leagues, and I muſt ſet my courſe thether weſterlie.

M. You haue aunſwered the queſtion Philomathes directly: Heere might we make an end of the vſe of the Sea-Card, were it not that I remember you propounded vnto me a queſtion heretofore concerning the degrees of Latitude: whether it were not better for the Mariners vſe, if they were greater then they be vpon this Carde: I muſt confeſſe, that generally all inſtruments mathematicall to be vſed either by land or ſea, are ſo much the more commendable by how much the more they exceede in quantitie: but touching the plaine ſea Carde though it be but of a verie ſmall pricke, yet may it be vſed as if it were 2. 4. or 8. times ſo great againe as it is. For as for the Rhombe they ſerue our vſe in a ſmall Carde as well as in a greater, and that ſo much the better by how much they come the nearer together, ſo that the compaſſes neede not ſo large an extention on the ſmall Cardes as they require vpon thoſe, which are of a larger pricke. As for the ſmallneſſe of the degrees of Latitude, they may be remedied by ſuppoſing 2. 4. or 8. degrees to be but as one, and ſo likewiſe may the leagues be taken twentie for 10. or for fiue, and one hundreth may be ſuppoſed to be but fiftie or 25. according as you alter the propoſition of the degrees of Latitude.

P. I pray you make this thing plaine vnto me, I doe partly

partly perceaue your meaning by your former words, but I would haue the matter laid open more manifestly.

M. When as the degrees of Latitude in your carde, and the leagues of the scale do seeme to be too little for your vse. First of all seeke out in it by the first proposition, the Rhombe vpon which the place, whether you goe, beareth from the place of your departure, seeke out also the Latitude of the place from whence you depart. Then suppose so many degrees of Latitude in your Carde (as you thinke good) to be but one, (for example sake suppose 4. of them to be but one, so that each seuerall Degree by this supposition is but a quarter, and each halfe degree is but halfe a quarter: and consequentlie in the scale of leagues 80 degrees are but 20, and twenty are but fiue, and the small space betweene the prickes is but halfe a League) according to this supposition you must pricke your carde and keepe your trauerse.

P. That I know, but when as I haue kept my trauerse according to that supposition, how shall I reduce the place, wherein I finde my selfe to be by my trauerse, vnto my owne Carde, that my card being neuer so little I may say that this, or this is the place wherein I am. As for example, if I were to go from cape S. Vincent to Porto Santo, my course lyeth southwest and by west. And this I perceiue that if I should suppose euerie 4. degrees of this card to be but as one, I must suppose Porto Santo to lye from cape S. Vincent 4. times so farre as it doth. Now say that I ranne from cape S. Vincent west southwest 60 leagues, then by the former supposition I must needes be in the point Z. which in the carde is beyond Porto Santo a great deale to the Westward, whereas I should be betweene cape S. Vincent and Porto Santo, therefore I pray you tell me how in my carde I may make a pricke representing the true place wherein I am.

M. This thing Philomathes is most easely done if you marke the proportion of your supposition. You suppose 4 degrees to be but as one, therefore the point Z. is 4. times so far from cape S. Vincent as it should be, so that if you diuide the

length of the line betweene the cape and the point Z. into 4. parts, the fourth part is the true distaunce from the cape. In like maner if you would know the latitude, wherein you are according to your Carde it selfe, deuide those Degrees of Latitude which are contained betweene the Latitude of cape S. Vincent and the Latitude of the point Z. into foure equall parts, for the fourth part giueth the Latitude wherein you are.

This thing Philomathes is worth the obseruing, for by this meanes you shall be able to vse your Carde of what quantitie soeuer it is.

P. I do now vnderstand better then I did before, and I obserue this as a generall rule, that I must alwaies follow the proportion of my supposition in finding out either the true Latitude or the true distaunce: for as touching the Rhombe that keepeth still his denomination. So that if I should suppose two Degrees of my Carde to be but as one, then must I take halfe the supposed distaunce for the true distaunce: and if I suppose 8. Degrees to be but one, I must take the 8. part of the supposed distaunce to be the true distaunce, and in like manner must I do in finding the true Latitude.

M. You say well Philomathes. And heere you are to note that you may suppose the place of your departure to be in anie place of your Carde where you thinke most conuenient to keepe your trauerse (or if you will you may keepe your trauerse vpon some blancke skinne which hath nothing in it but the lines) imagining the degrees to be as great as you please, and afterward you may applie it to your Carde by the vertue of the first proposition, which teacheth you the Rhombe being giuen and the distaunce to finde the true Latitude, and consequentlie the place wherein you are, the said Rhombe being drawen, and the distaunce accounted in your carde from that place, from the which you departed. Moreouer if it shall so fall out, that beyond the Ilands or other coast of the land set downe in your carde, there be

not

not scope enough for you to trauell, either East, West, North, or South, (as for example in this your carde, there is not space enough to trauell either from the Terceras westward, or from the Canaries southward) you may by the former rule suppose anie place in your carde to be the place wherein you are, and afterwards keepe your trauerse at your pleasure.

Thus much briefelie Philomathes concerning the vse of this plaine carde, wherein if I haue satisfied you to your contentment, I shall be glad, but this I could wish, that you should not alwaies addict your selfe vnto this kinde of plat, but labour and striue to be cunning in anie other, that are extant, that comparing the one with the other, you may make choise at the length of the best, though in the meane season you vse this as an help in your trauell. And thus: &c.

P. Now stay a while sir I pray you, there is yet one thing to be spoken of, which are the cyphers set round about the two flies, whereof the one is at the bottome, the other at the top of the carde, I would faine know to what purpose they are.

M. You remember that in the tenth proposition, wee spake of the Leagues, which we runne vpon euerie point of the compasse in raysing, or laying the Pole a degree, these Leagues are expressed in the vppermost halfe of that circle which incompasseth the great flie at the bottome of the carde, from A to B and from B to C and are adioyned to each Rhombe, or point of the compasse, whereof those, which are on the quarter A B are the English, the other on the quarter B C are the Spanish Leagues.

Moreouer in the eleuenth proposition, we spake of the distaunce from the Meridian in raysing the Pole or letting it fall a degree sayling vpon any Rhombe assigned. Those Leagues, both English and Spanish, are likewise expressed vpon the nether halfe of the circle, that they might be readie for those which are desirous to know them vpon a soddaine

without the vse of the compasse. The other cyphers which are set about the flie at the top of the carde, serue for the finding out of the height of the Pole by the north or Pole-starre, according as it is pointed with the guardes: So that by the placing of the foresaid figures you are to note this, that the former guardes being in the East, the North starre is one degree and an halfe vnder the Pole, and therefore you must adde so much (for so the letter A doeth signifie) to the height of the starre, that thereby you may finde the trew height of the Pole.

Item, the guardes in the West the starre is one degree and an halfe, aboue the Pole, and therefore you must subduct so much (for so the letter S. doth signifie, from the height of the starre to finde the height of the Pole. In like manner you are to adde or subduct the numbers set vpon the other points of the compasse vnto or from the height of the North starre according as the letters A. and S. doe direct you. These things Philomathes, the Sailers by their long experience, haue noted to be auaileable for their vse, and therefore they haue thought it good to put them into their cards, the which things you may apply also to your commoditie as occasion serueth, hauing the meaning thereof laide open vnto you, hereafter I will be readie to farther you in any other Mathematicall conceit, to the vttermost of my power.

P. I know it well, and haue had much experience of your good will, and therefore I thanke you, and I acknowledge my selfe a debitor for the same. But before we part, I pray you let me haue your opinion in this: what thinck you of Mercators card? and wherein differeth it from the plaine card?

M. Philomathes, I iudge it to be an excellent worke in respect of the proiection thereof, and might (by inlarging of it) be made most fit and conuenient for the saylours vse: it differeth from the common carde in this, that the degrees of Latitude are not equall, but ware greater and greater toward the Pole, whereby there ariseth a double commoditie,

for

for by this meanes the land is not so distracted as it is vpon Plancius his Mappe, who followeth the proiection of the plaine Carde, and it commeth verie neare vnto the Symmetrie of the globe, because the degrees of Latitude are so proiected, that each one of them may be the scale to measure iustlie the circumference of that parallell which runneth through the end of the said degree, so that you may trulie measure the distaunce betweene East and West, and it is therefore the best Carde, that euer I saw extant, whereon you may keepe an account of your longitude. In the vse of it the degrees of the equinoctiall are the common scale to measure any distaunce assigned, and your reckening must be kept not vpon the Rhombe vpon which your course lyeth, but vpon that Rhombe, which is so farre distaunt from the equator, or parallell of east and west, as the Rhombe, vpon which you made, your course was distant from the Meridian. Thus much Philomathes concerning that matter, I feare my speach seemeth darcke vnto you, and my leasure will not now serue me to shew you the booke, which I haue written concerning the vse of Mercators Carde. Hereafter when more leasure shall serue I will be readie to let you haue the sight of it.

P. I thanke you, in the meane time I bidde you farewell.

FINIS.

The name of a booke Jame to serue
the light of nauigation wherein are declared
& liuely pourtrayed all the coastes & hauens
of the west North & East Seas. set forth by
William Johnson at Amsterdam.

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